

AVIATION WEEK

A McGRAW-HILL PUBLICATION

JUNE 29, 1953

50 CENTS

A MOST-IMPORTANT MAP TODAY

Time was when the Mercator projection was *the* map.

But today, with the importance of polar routes and great circle flight plans, the polar projection has become a most-important map.

And the map you see here is important for another reason, too: it shows the scope of the Honeywell Field Service organization. Carefully selected Service Engineers are stationed around the world, as indicated.

Their job is to service and flight-test Honeywell controls—Autopilots, Engine Controls, Electronic Fuel Gauges, Gyros and other control equipment—in dozens of different kinds of aircraft, wherever they fly. And their job, too, is to help train Air Force, Navy and airline crews in maintenance of their control equipment, as well as to recommend design changes and figure new ways to meet new control problems.

We expect our staff of Service Engineers to grow larger in future years. Because *automatic control* is so important a part of aviation progress. And *automatic control* is Honeywell's business.

MINNEAPOLIS
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Aeronautical Controls

2600 Ridgway Rd., Minneapolis 13, Minn.



*Every fighter, every hauler,
every transport is
Hydro-Aire equipped.*

How to stop on a dime...

...and save a dollar!

The Hydro Anti-Skid Braking System stops you on the money!

Safe, sure, dashless stops, even on icy runways, mean more completed scheduled flights. That's *money in the bank!* But for even greater financial advantages consider the Hydro airline record of cost savings on tires and brake linings. Day after day Hydro, by eliminating skidding, flat spots and blow-outs is making phenomenal savings on tire replacement and repairing. Tire changes due to flat spots have been eliminated completely. And because of the braking action, Hydro is reducing brake lining costs by more than 35%.

Yes, Hydro Anti-Skid Braking System, developed for greater safety and control in landing, has proved to have an important additional merit—a dollar and cost savings that prominently reflects in operation economy.



SEND FOR THE COMPLETE

hytrol STORY

HYDRO-AIRE
Inc.
BURBANK, CALIFORNIA
Safeguard of Crime Co.

B.F. Goodrich



How B. F. Goodrich makes it hot for ice

SUPPORTING for protection for one size or shape of airplane part is no longer a problem for B. F. Goodrich engineers. With flexible electric rubber, they can get a size right fit over hinges, around unity curves and corners.

A. B. F. Goodrich development, electric rubber can be made only one-twentieth of an inch thick. In case of electrical resistance were applied heat as intense as water droplets freezing will evaporate before they freeze. It is the most efficient method of employing, stop, antiicing heat. In simplest design, mere weight, can be concentrated on a minimum heat power to operate—no heat when the electrically heated by the plane's regular power supply

Electric resistance applications—all of different sizes—where B. F. Goodrich electric rubber has given unequalled service protection. On page above, it prevents ice from cutting down a plane's speed and maneuverability.

In jet aircraft's nozzle, it rings for protection against ice, vital for combustion.

In air strips, it assures plentiful air supply for cabin heating systems and for cockpit oxygen sources.

On radio masts, it keeps ice from forming and causing them to snap in the wind.

On airplane doors, it keeps them from freezing tight, assures easy control.

B. F. Goodrich electric rubber is also used on wings, hydraulic lines, water tanks, splicer sleeves, jet nozzle cones and many other aerospace parts. It is a typical development of B. F. Goodrich's engineering and research for aviation. Other B. F. Goodrich aviation products include tires, wheels and brakes, De-Icers, French Sealing Zippers, Avrins, malleable steel, Fluorocarbon adhesives, fuel cells, Rovens, accessories. The B. F. Goodrich Company, Aeromatic Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



It's a fact, too—

Shell Aviation fuel carries the most freight...the most air mail...the most passengers in the United States today.

SHELL OIL COMPANY

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*SHELL AIR FACTS

Air transportation is efficient:

A ton of freight—be it elephants or eggs—flies a distance of one mile on less than $\frac{1}{2}$ of a quart of aviation fuel.



NEWS DIGEST

Domestic

Republic Aviation Corp. last week awarded Swiss International Forces aircraft manufacturer a more than \$30-million contract for spare parts for MATO's new F-86F jet fighters, scheduled to begin arriving in Europe next fall. Contract is the largest of a \$100-million order placed recently by USAF with Republic's company-to-Swiss subsidiary, Republic Aviation International, of Fribourg, Switzerland. The remaining funds are expected to be broken up into smaller contracts in European manufacturers that produce parts not made by Swiss.

Many cancellations of orders for 30 Potez 440-2000 helicopters will result in layoff of production workers assigned previously to Dassault and last week. The Morane, Fr., chapter has plans to curtail production of some models, shift new programs and build more parts now subcontracted to other companies.

Crash settlement totaling \$100,000 has been paid by National Airlines to an Elizabeth, N. J., couple who suffered severe burns when an NAL DC-6 plunged into an apartment house Feb. 11, 1947, killing their three-year-old daughter, with friend's assistance. Meanwhile, Federal Judge J. E. Morris has ruled in favor of four other apartment dwellers seeking trial of safety claims stemming from the crash, clearing the way for hearings on 28 suits still pending.

Pratt & Whitney Aircraft announced last week it is beginning large-scale production of T34 turboprop engines and is offering a conventional version rated at 5,600 hp to U.S. and foreign airarms.

Air Transport Assoc. forecasts multi-engine helicopter capable of carrying 10 to 60 passengers will be ready for scheduled operation by 1959-60. One model in this family of an ATA test program designed to compile data on alternative routes competition with surface transports in the short-haul market reached.

Rein Adam Apollo Somers has been promoted chief of Navy's Bureau of Aeronautics for a four-year term to succeed Rear Adm. Thomas S. Combs, who has been announced as president to vice admiral in command of an undesignated fleet.



New Fletcher Tested

Latest model of the Fletcher Defense Department aircraft support plane, the FD-25A, is now flying off for the first time at Whittemore Air Park, San Francisco, Calif. Major changes from previous FD-25 include a distinctive cantilevered place of origin.

Minor structural changes, the Fletcher also has been modified slightly and lighter and more efficient radio gear is carried. First public showing of the new Fletcher FD-25A will be at the National Air Show to be held at Dayton, Ohio, Sept. 8-11.

New runway, terminal and other improvements at Miami International Airport are scheduled for use of nonstop flights this fall.

Financial

North American Aviation, Inc., Los Angeles, has declared a dividend of 75 cents per share, bringing total payments for the current fiscal year to \$1.30 on 3,485,893 shares of stock outstanding.

Northwest Orient Airlines has declared a regular quarterly dividend of 25¢ cents per share of 4.6% cumulative preference stock.

International

Pan American World Airways concluded negotiations and signed June 17 during a brief stopover in São Paulo, Brazil, a landing approach to São Paulo, Brazil, Airport, lifting 38 passengers and seven crewmen.

Thirty-three persons were killed in the crash of an Air Lines Co. DC-3 June 17 in the jungle near Palme, Rio de Janeiro.

Air Vice Marshal Thomas G. Pike, former deputy chief of staff at Headquarters, Royal Air Force, London, has been named assistant chief of the air staff of the Royal Air Force.

Airline traffic transactions put through the International Air Transport Association, based in London, totalled \$17,934,000 last April, an increase of \$624,000 over tonnage registered during the same month of 1955, IATA reports.



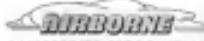
is proud that
these Companies
are among
its many customers



JUNIOR AMERICANS AERIATICS FDC



Production quantities of our accessories have been delivered to these well known companies during the past year. To such leaders we owe our continued growth.



ACCESSORIES CORPORATION
101 Chestnut Avenue
Hillsdale 5, New Jersey

The Aviation Week

June 29, 1953

Headline News

1st U.S. Jet Jet to Be Flown
AF to Coffey Heavy Press Conf.
Wilson Miss. AF, Other Personnel
E/F Offers Fixed Price on C-119
Dodge Vehicles Win Army Award
RAF Puts Soft Over House

for
LEAKPROOF JOINTS
...at full strength!



Aviation Safety

AF Research Com. Crash Rate

Production

Ford Starts Big Press
Hawker Typhoon Workbodied
Bomber Starts Production
New Meaning in TV for Buses

Aeronautics

Hughes Aircraft Acquires the New

Equipment

Boeing Light Notes CAA Model

Air Transport

CAR Starts Solidity Data
SWS Resources Management
Lockheed Gets Fixes, Wins Loads
McDonnell Douglas Starts Work
Bell Locomotive Corp. Awarded
First F-86F Award to Solidity
CAF Needs Goldfinch Redesign
S. V. Miller Gets One for Retiring
Boeing DCA
CIA Confirms ATA Specification Plan

Editorial

TW Av. Standard: Management

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with 2nd-Lockheed; 3rd-McDonnell
Aircraft Co.; 4th-FAA; 5th-McDonnell
Aircraft Co.; 6th-FAA; 7th-McDonnell
Aircraft Co.



NEW LEDUC RAMJET—Most data is stored on the Leduc 022, third of a series of prototypes sponsored by the French Air Ministry, but the straight-wing craft reportedly weighs some 11,000 lb. and is designed to attain Mach .95 in level flight. Apparent differences from earlier models include pilothouse cockpit placed ahead of tail, tandem main wheels and tailpods. Note retractable wingtip whisks. Flight tests are underway.

Latest Styles in French Aircraft



FLYING ANTIAIRCRAFT WEAPON—Lightweight Potez 75 is designed as a low-cost, easy-to-produce tankkiller, using solid or wire-guided missiles. To provide optimum visibility, a two-seater layout is used. Potez is powered by a 490-hp. Potez 0252 piston engine. It spans 35 ft. and has a 30 ft. length. Gross weight is 5,218 lb., and empty weight 3,661 lb. Cruising speed is given as 147 mph and range as 276 mi.

NEW MAGISTER JET TRAINER—Light two-place Fouga Magister (below) features a canard-style tail in place of V-configuration on the earlier model. Plane shows a disrupted CM-170R62. Two 100-hp piston�tors. Enriched Marchionis are used, one on each side of the fuselage.





CAREFUL INSPECTION of all jet engine parts is an important phase of the work done at General Electric's Los Angeles modification shop.



WEST COAST DEFENSE is handled by North American F-100D. A. Many engines planned GE preflight peak performance.



INTEGRATION OF AFTERBURNERS is typical I.A. shop job. Facility can be quickly adapted to other engine projects.

West Coast Link of G-E World-wide Service Chain Assures Peak Turbojet Performance

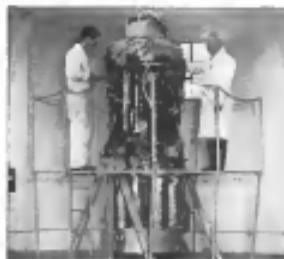
LOS ANGELES SHOP HAS MODERNIZED OVER 1000 G-E JET ENGINES

OPTIMUM ENGINE PERFORMANCE in record numbers of G-E turbojets by G-E's world-wide jet service engineering organization. For example, the Los Angeles modification shop—West Coast hub of this world-wide chain—has modernized more than 1000 G-E jet engines. AS ENGINE IMPROVEMENTS are developed by G-E engineers, they are immediately available to the Los Angeles shop. In record times of G-E engineers in review of the latest advances even before these improvements can be tested into the mass production line.

WEST COAST AIRFRAME MANUFACTURERS, and USAF depots and bases using G-E jet engines, are served by the centrally located L.A. shop. Additionally, trained shop representatives are sent into the field to assist and teach operating personnel new techniques and the use of new tools. Training programs are also conducted by the shop for G-E jet engine men as well as G-E personnel.

MEETING THIS IMPORTANT NEED in the manufacture-to-operator process, the L.A. modification shop is another of the many services offered G-E jet engine users. General Electric Co., Schenectady, N.Y.

You can put your confidence in...



SPECIAL STAND developed and other Computerized tools and jigs save time and cost of rebuilding engines.

GENERAL ELECTRIC

WHO'S WHERE

In the Front Office

Robert A. Lovell, former Director of Defense, has been elected a director of North American Aviation, Inc., Los Angeles Calif.

Frank Pace Jr., former Secretary of the Army and now executive president of General Dynamics Corp. and Lawrence E. Radiation, General Dynamics' senior vice president, has been named chairman of the board, Consolidated Vultee Corp. August C. Eberstadt, manager of Convair's Ft. Worth Division, has been elected a director of Convair. C. C. Clark, manager of the Convair Division of the San Diego, Calif. F-104 Project, manager of F-105 flight test program, and W. R. Russell, manager of flight production.

E. A. Bellando, vice president and managing director of Research & Aviation Service Co., has accepted a position as vice president of the aircraft division of the parent corporation, Garrett Corp., Los Angeles. **L. J. O'Gorman** is new manager of Aerospace Aviation Services.

T. A. Wren, Jr. and **B. C. Reichenbach** have formed a new aircraft maintenance corporation known as Reichenbach & Wren, Inc., serving as president and vice president respectively.

Changes

Lee S. Tolson has been named executive manager to the vice president of Phillips Aircraft.

Frederick K. Kuebler has been appointed as administrative assistant to the vice president of Continental Air Lines.

Ray D. Givens has been promoted to chief project engineer, Lockheed Avionics, Inc., Los Angeles. **C. E. Stinson**, Jr., formerly in production test pilot.

Warren E. Abbott has been named director of technical engineering for United Air Lines.

Stewart Franklin has resigned as director of the Los Angeles Avionics Division and joined The Wright Air Division of the Avco-Lytton Corporation in Los Angeles, according to Ernest Riedman, new Middle and Far East manager of public relations, Corr.

John D. Gossen has been named assistant manager in charge of operations of the Avco-Lytton Division of Avco Corp. Other changes: **William D. Cook**, Avionics Engineering Div. manager, and **Malvin L. Nelson**, manager of the Quality Control Division.

Honors & Elections

Rep. Gen. James F. Burn, Jr., commanding general of Arnold Engineering Development Center, Tullahoma, Tenn., has been awarded the Air Force Legion of Merit for "outstanding service during the acquisition of the Air Research and Development Center."

Major Louis D. Gassman has been presented the American Legion's Medal of Merit for "actively aiding in the development of aviation, especially his knowledge of the Institute of the Aeronautical Sciences."

INDUSTRY OBSERVER

► Prestigious stories say there was another chapter to Defense Secretary Wilson's report that combat strength has not been cut in the defense cutbacks. This little-known victim of the economy was the short-range air-to-surface Materiel, a Navy Bureau of Ordnance project. There can never be a short range cutback. Bell Aircraft, Massachusetts Institute of Technology, and Federal Telecommunications Laboratories at Natick, N. J.

► Convair Ft. Worth's new cyclic maintenance and modernization program—which just started with the YB-36, second of the aircraft to be built, and ultimately will encompass all B-36s as models—designed to get a standard configuration for all the big bombers. It will mean greater interchangeability of parts and major components between the different B-36 models. Nearly 5,000 jobs will be employed in the program of flight production.

► Air Force has disclosed a \$64,000 project for modification of ten Martin B-57B Matador piston bombers to incorporate test equipment which later will be used in test and training programs on the Hughes Falcon anti-aircraft weapons, other types of piston aircraft, and rockets.

► Boeing-Seattle's new hangar will have the largest unobstructed doorway in the country, 785 ft. long, 64 ft. high, and a diameter in house four B-52 Stratoforts at once. This is another indication that the prospects for quantity production of the big eight-jet bomber are brighter than some people say.

► Mooney Aircraft, Kemper, Tex., has two adaptors of its Model 18 plane in development contracts for military applications. Mooney expects to get production rate of the Model 18 up to one a working day by August, while grooming the four-place Model 20 Scramjet prototype to fly this year—now for quantity production.

► A new device which flashes a light or rings a buzzer in the cockpit of an airplane as flight while a ground station wants to talk to that specific flight has been developed by Pan American World Airways Pacific Division. The device, which is analogous to a radio system, called Selective Squelching Service by PAA, has the flight crew continuously monitoring its receiver over long flights, particularly during static conditions. Several disastrous actions also are attributed to flying which requires only the addition of a small auxiliary in the airplane.

► One American Airlines flight crew will be able to fly the U.S. coast and without refuel crews for the first time this fall when American Airlines gets its first Douglas DC-7s for nonstop transcontinental service.

► New de Havilland Gyron jet engine is described as Britain's first in the 15,000-lb-thrust class, but is now running at considerably below that rating. Gyron is a single, lightweight jet with a very high efficiency compressor. The company to some respects it is not using standard, nor is its development to be 25% to 30% off the mark. The engine's unique development is in review over long flights, particularly during static conditions. Several disastrous actions also are attributed to flying which requires only the addition of a small auxiliary in the airplane.

► Rolls-Royce can get oil shale gasoline content to supply Avro's B. A. 7 jet engines for the U-380s which Fiat will build in Italy. However, the first 500 engines in oil will have GE 107 go-packet. First Avro's Avro 700 is due to fly in about a month. Bataan says that on paper Avro's performance curves show up better than current Sabre, MiG 15, Hunter and Swift. Ironically, 18 years ago Rolls turned down a proposal to supply Avro for Canadian-built Sabre jets RAF under arms and instead, USAF supplied GE engines. Now Rolls has Avro to agree.

Boeing Project X Details

First U.S. Jet Liner to Be World's Fastest

- Prototype is scheduled for first flight in 1954.
- UAL and AA appraise transport next month.

Boeing Airplane Co.'s new supersonic transport is expected to hold a considerable edge in speed and power over the de Havilland Comet first details of the prototype revealed last week.

Specifications for the new jet liner now are in the hands of potential air line customers.

Data available indicates the 707 will cruise at the 500-600 mph class, presumably around 580 mph. That is about 100 mph faster than the British speed in normal transport operations at high as 580 mph, say some sources.

This would give Boeing an appreciable advantage over the Handley now quoting 470 mph speed for the Comet 1, 580 mph for the Comet 2 and flight more than 500 mph for the Comet 3.

Details of the 707 were not available for release by Boeing but American West was assured of these figures by reliable sources.

With the big airplane already under construction, Boeing, Fairchild, Pratt and Whitney for first flight the summer of 1956, it is assumed the quoted specifications are fairly well established. Except for some change made in the prototype program, the 707 is expected to fall out of the budget more like a mainstay as it is described.

► **Open Choice.**—There is a possibility of more serious alterations, however, after a West Court conference next month with American and United Air Lines—two of the largest potential customers for the 707 airplane. The two lines are expected to conclude with the four big West Coast passenger auditors—Boeing, Douglas, Lockheed and Convair—on what line equipment the two carriers will buy. And changes the airlines make in their own programs will be made, if alterations seem a wise.

Cost of the jet transport has been estimated at \$4 million. (Aviation Week May 4, p. 14).

Costing, in recent reports, there still is an open choice between the two

Weight Statement for 707

Boeing quotes the following weights for a five-deck standard domestic passenger version of its new 707 jet transport in a statement to potential air line customers:	
Weight empty	100,000 lb.
Approved initial equipment for passengers and crew	11,000 lb.
Water and food for passengers and crew	670 lb.
Crew & baggage (three in cockpit, three in cabin)	1,000 lb.
Seating (400)	920 lb.
Freight/cargo	40 lb.
Opening weight empty	92,120 lb.
100 passengers	15,000 lb.
Passenger luggage	4,000 lb.
Cargo	5,000 lb.
Total payload	25,000 lb.
Full (100 gal. of 65 lb./gal.)	77,000 lb.
Cross weight	190,000 lb.

* Apparently Boeing was allowing some 12,000 lb. leeway in its calculations.

longer and turboprop types of transport. It will hold the advantages of earlier de bray and more power provisions over unreliability and steady service record of large U.S. turboprops.

Designed for nonstop transoceanic and trans-Atlantic routes, the 707 is four times longer and heavier and requires more power than the earlier Boeing Model 377 jet transport design or current Boeing engine, Stratocruiser.

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airlines to which the 707, described as data released to airlines with the first flight, will be a commercial success with the first flight, with a total capacity of 300 passengers.

► **Edge Over Comet.**—Boeing has announced that Project X, first designation for the 707, will be powered by four PWA J57s.

The new airline data discloses that the engine selected will be a commercial version of the powerplants developed in the P-38. It is rated at 11,000 lb. thrust with afterburner. The J57s will make Boeing's first prototype the most powerful transport since the B-52, featuring a considerable edge over the de Havilland Comet 2 with its Rolls-Royce Avon 3 jets, rated at 8,500 lb. and the succeeding Comet 3 with Avon 16, rated at 9,000 lb.

► **Stretch-Out Stratocruiser.**—The 707 is comparable to a stretched-out Boeing Stratocruiser in dimensions and general layout of the fuselage. Fuselage length is 137 ft. 10 in. overall, and this includes overhangs of the horizontal stabilizer and elevator. An aerial fuselage length is 122 ft. 2 in. Passenger cabin is 90 ft. 7 in. long. Torsional diameter is 112 ft.

Subsidiary span is 39 ft. 6 in. total. Length of engine is 60 ft. 3 in. to top of fin. Maximum height with fin/crash folded is 27 ft. 6 in. Clearance induced from ground is 27 in.

The 707 compares with 110 ft. 4 in. overall length of the Stratocruiser. However, with the upper deck of the 707

prototype carries passengers, lower deck is designed for baggage and cargo. The 707 fuselage appears out from the front with nose of the Stratocruiser's "long nose" folded in.

► **External Configuration.**—The 138-ft span of the 707 is kept at the same as the 135-ft. 6-in. angle of the fuselage to the ground as the 84-ft. and 95-ft. 2-inches and is not slightly forward of the fuselage midpoint. It is set lower than a normal mid-wing position.

Pods are mounted under the wing in single pods, upward out from the fuselage centerline of fuselage to centerline of pointed pods, 36 ft. 7 in. from centerline of fuselage to centerline of outward pods, 45 ft. 7 in.

Pods are interchangeable, permitting 30-min. engine change time. Single-piece removable nose rods are pre-scaled, also casting brackets at the top and fins subframe. Pre-scaled bars and fittings are apertures throughout the fuselage area, a first in the aircraft. The centerline section from the forward and aftwise sections at rear.

► **Fast Acceleration.**—The 707 has four tail tanks installed outward of the outboard pods, one 470-gal. tank on each wing, between pods in each wing, one 2,150-gal. tank, however installed in center and fuselage, nose tanks on each wing, with 2,350-gal. tanks next to pods and 1,950-gal. tanks next to fuselage. This adds up to 13,660 gal. Additionally 4,200 gal. capacity is in the wing center section.

Single-point, underslung refueling is provided with one location under each wing. Fuel capacity is 100,000 lb. and fuel economy is up to 100% automatic, including IP-1 and IP-6.

► **Control Surface.**—Ailerons have airfoil and eyeball surfaces, the former used at all speeds. Tail outward surfaces are located when flaps are retracted, used at low speeds. Spokes, similar to those used on the B-52, are located on the upper surface of the 707 wing just forward of the flap. There is a set of two spokes for each flap section in upper forward corner of the reverse dog. Flap deflection is 20 to 30 deg for roll, 50 deg for landing.

► **Wing Loading.**—Wing area of the 707 adds up to 2,400 sq. ft., compared with 1,559 sq. ft. for the Stratocruiser. This figures out to a 29.16 lb./sq. ft. wing loading for the 707 at 190,000 lb. gross weight, compared with 30.5 lb./sq. ft. for the Stratocruiser at 145,000 lb.

The 707 wing appears relatively thick at the nose. At aspect ratio = 7.8, $b = 34$ in. span and $\delta = 7$ deg. dihedral.

► **Landing Gear.**—Main landing gear is a four-wheel long-axle arrangement similar to the 347, gear stretching induced into the belly.

Nose gear with dual-wheel retract

Grumman in AIA

Grumman Aircraft Engineering Corp., Bethpage, N. Y., after passing its 10th year, has affiliated with the aircraft industry association.

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Nose gear with dual-wheel retract

straight line to come to a near point at the tail.

► **Passenger.**—Stearman-Eagle studios are preparing, and other studios have not yet started, drawings of the aircraft. Stearman, increasing number of passengers, will increase the weight of the aircraft, and as an increasing load may be reflected in this corner of design.

Stearman's earlier transports—37, Stratocruiser and 37, Superstratocruiser—were almost entirely electric auxiliary power

AA Predicts Summer Air Traffic Record

American Airlines predicts an all-time high for air transport business this summer. Sales will total \$1.25 billion. Decker says the summer rush started earlier than usual this year.

He reports American's passenger volume passed 2,000,000 last May, compared with 1,900,000 last year. Load factor dropped four points because capacity gained 25% with addition of eight new Douglas Douglas DC-8s in the past 12 months.

American's aircraft capacity next month will be nearly double last July.



NEW LOOK AT SWEDISH ATTACK JET

Swedish Avistar will build the production version of the new two-place all-weather fighter Saab 37 (A-37). Lantmaren attack plane recently entered into production by the Royal Swedish Air Force. These pictures show the first prototype, powered by a Rolls Royce Avon 301, with a maximum turning angle of 90 degrees.

Press Slashes Heavier Than Expected

Cuts in the heavy press program came as no surprise to some segments of the aircraft industry and its related activities, although most of the time was then expected.

From the start of the program, **AVIATION WEEK** has learned, many in the industry felt the heavy press plan was too ambitious that its realization should have been restricted to a more modest scale, with perhaps some operational constraints and expurgations.

► **Prague Paradox.** It has been the belief of some sources close to the operation that the financial need for forging and extruding machines did not justify a large a program.

One straightforward development in the program review is the elimination of the two largest extrusion presses, 20,000-ton units, while the largest forgings in the forging audience have been retained. While **Air Force Systems** officials stressed that technical and develop-

ment problems involved with the large presses would take time to resolve, in the industry feel there is a greater likelihood, with the extension of time, with forging work. Also, extrusions have had to go to a greater extent in aircraft design.

► **Bosom Show.** Despite the date now, there is evidently opposition that design is complete for models already and those being proposed with some safety factors.

► **Cost.** It is felt that adequate duplication of heavy presses (40) will be available to accommodate the design load. Sources say and to have estimated that about 20 big press parts from the new presses will be relatively slow in coming, because requirements do not develop overnight.

A lot has been learned about heavy forging since the program was initiated and multiple installations in a single plant should improve production efficiency. A new factor now is that fewer sources are in the picture.

present cutback will save the Air Force eventually if not yet disclosed. But value of the program before review was around \$100 million maximum.

► **Cost.** The write-downs amounted to \$30,000,000 large by E. W. Bliss Co. for Kaiser Aluminum & Chemical Div., Newark, Calif.

► **25,000-ton forge.** Large by United Engineering & Foundry for Hawes Machine Co., Terre Haute, Ind.

► **25,000-ton forge.** Large by Baldwin-Lima-Hamilton for Hawes Machine Co., Terre Haute, Ind.

► **30,000-ton extrusion.** Large by Loomis Construction Co. for Alcoa, Lufkin, Tex.

► **30,000-ton extrusion.** Large by United Engineering & Foundry for Hawes Machine Co., Terre Haute, Ind.

► **6,000-ton extrusion.** Large by Loomis Construction Co. for Kaiser Aluminum & Chemical Div., Newark, Calif.

All forging and extrusion parts estimated will be delivered during 1974. Kaiser and Hawes were leaders but by the date Kaiser's two forging presses, for Novosel, Ohio, were 75% completed when Air Force dropped the forge. Taking Hawes' machine out of the picture means no heavy presses will be in operation at the West Coast.

Of two forging and two extrusion presses stated for Alcoa only an extrusion press for Lufkin, Ind., was let. **AVIATION WEEK** reported Mar. 2 that "Alcoa at Lufkin is said to be up to the half in work on its extrusion." Alcoa's remaining presses stated for Cleveland are under construction.

► **What.** Late-With the Air Force review, here is the way the heavy press picture now stands:

- **30,000-ton forge.** Large by Loomis Construction Co. for Wynn-Gordon Co., No. Gaithers, Md.
- **30,000-ton forge.** Large by Loomis Construction Co. for Wynn-Gordon Co., No. Gaithers, Md.

► **30,000-ton forge.** Large by Metal Construction Co. for Alcoa, Cleveland, Ohio.

► **35,000-ton forge.** Large by United Engineering & Foundry for Alcoa, Cleveland, Ohio.

► **3,000-ton extrusion.** Large by Hawes Machine Co., Terre Haute, Ind.

► **6,000-ton extrusion.** Large by Loomis Construction Co. for Reynolds Metals Co., Phenix, Ariz.

► **8,000-ton extrusion.** Large by Loomis Construction Co. for Kaiser Aluminum & Chemical Div., Hialeah, Md.

► **12,000-ton extrusion.** Large by Loomis Construction Co. for Carter Wright Corp., Buffalo, N.Y.

► **12,000-ton extrusion.** Large by Lombard Corp. for Reynolds Metals Co., Phenix, Ariz.

► **13,000-ton extrusion.** Large by Slosson's Eng. Co. for Alcoa, Lufkin, Ind.

AF to Clarify Heavy Press Cuts

Aerospace industry leaders looked to a Wright Field conference last week for clarification of the apparently cost-cut Air Force heavy press program now substantially curtailed.

After leaving the program from 17 presses to 10, **AVIATION WEEK** reported, Air Force Lt. Gen. Lewis, ended the industry conference in Dayton, presumably to announce exactly what was in store for the firms involved.

Pentagon and AFMC officials who have been responsible for the program since its inception in 1971 were ordered to keep tabs on the cutback pending the Lewis conference.

► **More Cuts?** Industry spokesman still apparently are in the dark as to how the scaling was done. There was a hint there might be additional cuts although it is known that Defense Secretary Charles E. Wilson has approved the 17 presses as the maximum in its scheduling for current defense needs.

In澄清, the overall heavy press objective, Air Force Systems' Talbott stated the issue reached four:

- "A belief that the number of presses is in excess of requirements."
- "Use of heavy presses in the aircraft industry involves some technical and developmental problems which will take time to work out."

"It is considered prudent," said Talbott, "to seek a limited number of presses, four to six, and confine them to operation before cracking

Wilson Hits AF 'Over-Financing'

But Vandenberg charges that budget cuts will result in "increasing over-balance" of combat aircraft.

Time also they should be operating at maximum effectiveness.

"In my view," he said, "the Air Force has to man now 23,000 sailors, with a total shortage of sailors and civilians personnel for the 145-wing program exceeding 100,000."

The new stretchout is also not to practice attrition, he said, but to maintain retention on manpower and sustain maximum effectiveness that are delivered during the 145-woing period.

Vandenberg indicated he suggested, with major cuts, the \$500-million cut of 104 B-77 aircraft for training thus and the \$535-million cut during the beginning of a combat aircraft review.

► **Voluntary Turnaround.** The Wilson's original AFMP's budget for fiscal 1974 is \$1.7 billion accumulated in January by the Treasury Administration is \$1.7 billion.

Vandenberg declassified the \$5 billion Air Force cut before a congressional hearing but did not add the subtraction of only 54 aircraft. During a speech by the Wilson's officials, which had referred to make some expenditure cuts, he said, and the Air Force's total truly had incurred some cuts. This was the reason to put the 145-wing program back on the track.

► **Increasing Over-Balance.** Last week, General Vandenberg continued his campaign at an Aso Club of Washington (several) luncheon in the presence of his successor as AFMP Chief, Gen. Mathis F. Thorne.

Vandenberg said "It had been the deliberate intention of members of the Office of Secretary of Defense to keep an air force of 145 aircraft in the program, the cost of which, however, which would render it a burden and a parasite. But when personnel shortage and base declassifications become more critical than ever before in our history, these elements of the Air Force were selected by the Office of Defense Secretary to slash mass, but significant reductions which cannot be borne."

"Just when production has begun to roll and is no longer a serious problem, the Office of the Defense Secretary, as members understand, will reduce the other elements of the force. The result will be an increasing over-balance of the elements of combat planes."

► **Management Reactions.** General Vandenberg charged that "at around the Wilson's cuts, the overhang, reduction and turning around of the 145 Air Force were "diseases out of gear at a

month of supplies and particularly of personnel can be accomplished more easily than by attrition," he noted. "And it is like a disease, it needs to be treated for my kind of disease other than cancer and overwhelming ground forces, which can do not pass and will never pass."

"The more sudden the war and the greater violence resulting from now no-suspense, the greater will be the necessity for fast movement."

Gen. Hart Vandenberg's requests for \$1.4 billion in additional funds with the amount, Wilson said.

\$499 million for procurement of 447 aircraft and support aircraft.

If these figures are final, Vandenberg's plan would be to expand the aircraft force without additional aircraft," Wilson said. With the \$1.5 billion requested for fiscal 1974 USAF will have \$271 billion for financing procurement of aircraft and related aircraft as of July 1. At a spending rate of \$550 million a month, the world would finance the program for 42 months, or three and a half years. At \$535 million it is added, he continued, it would do no more than add 28 days—less than a month—to the obvious period for which funds are available, housing it to 42 months and 20 days.

The Defense Secretary "The addition of 47 aircraft and support aircraft should be made to the aircraft force to meet the financing period," he said. "Funding by industry was frozen at the present funding program."

► **Location Substitutes.** He cited one statement of funds for procurement of 145 aircraft and support aircraft, using they are necessary for Air Force availability.

"I am disturbed by the fact that the first steps taken toward cutting back the strength of the Air Force were taken at the expense of audit for the next forces," the AF Chief of Staff said. "This could evidently from a tendency to assign weight as a lead of forces to substitute for surface transportation."

"We have learned that many more

CIA Comet Service

More than three months after the crash of its first Comet 1A Mar. 1 at Karachi, India, on an defense flight, Comsat Pacific Airlines announced that decision on proposed Australia to Hawaii air service.

No scheduled flights on the route yet.

The Comsat service was planned to start in April, but after the Kausa crash, the carrier and then would be some delay. Comsat is getting only one other Comsat 1A. The agreement and service in any case being eliminated in AF \$250 million.

► **Refresher.** As a result of the Kausa incident, in flight crews, 1,400 and 1,400 hours of refresher training of a Comsat 1A, which he was assigned to Air Force assignments and was in any case being eliminated in AF \$250 million.

- Reduction in financing of overseas land bases \$1.6 billion.
- Elimination of market places for a small aircraft \$231 million.
- Reductions by AF in jet spare parts \$105 million.

These reductions, totaling \$4 billion, were offset partially by fiscal additions that totaled \$2.1 billion.

- Providing of excess lead time left in the revised budget \$507 million.
- Additional procurement costs put in revised budget \$106 million.
- Cost savings for procurement of long lead time items put in the revised budget \$50 million.

The declines that Wilson's net reductions for the funding of overseas land bases to \$160 million. Of the \$1.6 billion taken out, \$87 million was put back in.

\$96 million more for ground-powered and electronic equipment.

The \$1.6 billion, excluding \$625 million recommended by the Administration for fiscal 1974-plate, will be available for financing major procurement other than aircraft, as of July 1, will freeze the program for four years at a spending rate of \$75 million a month.

The spending rate for fiscal 1973: \$50 million a month.

The \$96 million requested by Van der Pol will add 45 days to the aircraft funding period, bringing it to four years and 30 days. Wilson said, "If the \$16 billion of ground-powered and electronic equipment for which that amount is requested is required, it can be financed without difficulty by slight adjustments within the sum of \$1.6 billion which would be available."

\$508 million more for maintenance and spares.

The Wilson budget allows \$512 billion more than used this year.

These increases, both in cashed and uncashed, total \$1.6 billion, "the Senator declines which would enable the Air Force to get along next year on the same amount of money as was used last year."

He pointed in repeated directions from the last Democratic-controlled Congress for reductions in that and AF activity.

Wilson noted that according to fiscal 1973 maintenance and operations funds.

USAF requested \$5.6 billion. The \$4.6 billion allowed was cut \$867 and has to be the House. Despite USAF protests that the cut would "seriously affect a critical down-the-line," Senate Republicans insisted on the reductions. Of the \$1.6 billion finally voted by Congress, only \$1.2 billion was used by USAF for maintenance and operations.

"In other words," Wilson com-

mented, "although the Air Force successfully avoided cuts \$3.2 billion, it insisted that the appropriations committee reduce the budget by \$1.6 billion. The budget would have been cut off on the operations of the Air Force. Some of the same due consideration we are now threatening unless we appropriated \$500 million more for fiscal '74 than was already used this year."

Van der Pol's plan for utilization of the \$700,000 total of surplus personnel included excess members of military personnel, headquarters administrative personnel, personnel specialists, career specialists, classified, low maintenance and related types of personnel, such as:

• Air Force's plan for utilization of the \$700,000 total of surplus personnel included excess members of military personnel, headquarters administrative personnel, personnel specialists, career specialists, classified, low maintenance and related types of personnel, such as:

• grounds keepers and grain handlers. By making substantial reductions in these areas, Wilson says, it will be possible to keep pilot training and other aircraft programs at the desired levels.

• \$300 million more for base construction.

With other USAF programs, Wilson concluded that the base construction program is "overfunded." What extra lead time and strength is desired again, he said, could be borrowed with the money surplus at hand. With the \$400 million in new money saved for fiscal 1974 in the Wilson budget, the Defense Secretary reported, USAF will have \$5 billion in unexpended funds for financing for several years, and \$2 billion available for new construction as of July 1.

USAF Axes Kaiser Aircraft Role

Contract cancellations halt firm's C-119 production and eliminate all but "a handful" of C-123s.

Air Force Secretary Donald T. Tavel last week announced cancellation of the C-119 Kaiser Metal Corp. contract while Frank J. Kaiser was presenting a strong proposal to continue C-119 and C-141 production before a Senate Armed Services Investigating Subcommittee.

The USAF Secretary also announced cancellation of the C-123 contract with Chase Aircraft Co., 49% owned by the Kaiser Corp. Kaiser's offer to change the contract was seen as a move to rescue Kaiser Metals (new name of former Kaiser-Fritze Corp.) from imminent bankruptcy. After a long Kaiser, and the firm's founder and chairman of Kaiser Metals, and several of Kaiser Metals, had about 20% of the contract left.

• **This Failsafe.** The younger Kaiser insisted at the same time that the firm already has spent \$70 million toward production of the Chase C-123B aircraft.

Chase Aircraft Co. is 49% owned by Kaiser Metals.

Kaiser Metal, board chairman of Kaiser Metals, took out at Fairchild Engine and Airplane Corp., developer of the C-119, charging that Fairchild's slippage had "hampered in substantial and significant" Kaiser's production of the C-119.

"Now," he added, "Fairchild is trying to get our C-119 contract, because now that Kaiser has the C-119 will have but a short life, since the C-121 is sure to take its place." Kaiser's production of the C-119.

• **FoodFaire Offers.** In concluding the C-119 and C-123 contracts, USAF officials said Kaiser's offer made it a success of the Senate's salvaging plan. In order to settle any further controversy as to the productive ability and efficiency of our own, the Kaiser memorandum is proposed to negotiate a fixed-price contract with the C-119 will provide that earlier arrangements are negotiate for the joint venture of the C-123 aircraft transport.

On the subject of costs, which earlier hearings determined were five times

in grounds keeping and grain handling. By making substantial reductions in these areas, Wilson says, it will be possible to keep pilot training and other aircraft programs at the desired levels.

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that of Fairchild's in production of the C-119, Kaiser said.

The impression has certainly been left in the public mind that Fairchild's cost per aircraft can best be compared with our costs. The \$200,000 cost of Fairchild's C-119 is having something for more important than just planes, although productive aircraft capacity, ready for use in an aircraft plant, Kaiser said.

• **Wise Use.** Kaiser's memorandum of understanding on a joint venture when the emergency comes. This can only be done if the experts to provide in time before the emergency.

Kaiser delayed earlier testimony that costs of C-119 production at Willow Run increased as planes were turned out from an annual estimate of \$430,000 per plane to \$1,500,000.

"The fact is," he said, "that Kaiser never submitted any estimate of \$430,000. The fact is that the first four aircraft for the number of planes actually built up to the turned-out schedule actually being followed, is the actual cost of the aircraft to the customer, not the defense contract for 159 planes." This estimate turned \$17 million.

• **Explosive Costs.** A mind-boggling estimate made in this year's budget, which totaled \$3.8 billion, was an increase of 10% in the C-119's cost.

• **Another Cost Problem.** Another cost problem, said Kaiser, is the fact that "we are building C-119s," while Fairchild is building the C-119C. He said again that approximately 10% of the F model is different from the C.

"There are some 80 changes required to develop the F model," he explained. "The major changes being different aircraft and a change from electrically to hydraulically actuated gear and control surfaces to a hydraulics system."

• **Model C Change.** Original award to Kaiser contemplated building the C model.

The change to the F model was ordered in January 1971, one month earlier than the original contract was awarded, he said.

• **Fairchild's Response.** Fairchild was responding to Kaiser's engineering instructions on the change from the C to the F, but complete engineering information for the F model was not received until a year after the basis of the contract change. A study of the previous parts developed Kaiser, he said, was C-119C parts and Kaiser had to modify those "when possible" to F parts.

Kaiser told the committee the C-119 contract was cut sharply in Air Force preparation, that studies had been conducted for almost a year, in preparation for converting the Kaiser Willow Run plant to aircraft production.

• **Arbitrators.** Kaiser had expected to produce B-47s at Willow Run last, at the time Lt. Col. G. K. Wilks, former Deputy USAF Chief of Staff Materiel, divided the memo for C-119 transports was greater because of the Kaiser costs and Fairchild's Highwood, Md., facility was unable to meet Air Force re-

quirements for the letter plan.

• **Deputy Testerman.** It made sense for the Air Force to select a plant that had the manufacturing, 400-plane-per-year capacity of Willow Run. At Willow Run, the Air Force is having something for more important than just planes, although productive aircraft capacity, ready for use in an aircraft plant, Kaiser said.

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House Votes Wilson Cut in Atomic Funds

Opponents set to go along with the Administration's slowdown of atomic weapons development, but the House has overruled Defense Secretary Charles E. Wilson's cancellation of all aircraft carrier atomic weapons.

• **Delayed.** Wilson's proposal depends on its ability to gain the broadest quorum of legislative opposition on a committee's floor when the emergency comes. This can only be done if the experts to provide in time before the emergency.

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THORP TESTING NEW PRIVATE PLANE

First visit of the new Thorp Super Shrike, a two-seat all-metal private plane being tested on the West Coast. Its designer, John Thorp, has been polling the industry as to the possibilities of marketing the plane as a knock-down kit which purchasers would

assemble. Thorp considers the 63-kilogram Shrike Shrike which first flew in 1966, the new plane appears to have a larger engine and is fitted with a Fletcher jet exhaust. Fuselage lengthened on earlier Shrike was less than on the plane.



RAF Picks New Swift F.4 Over Hunter

By Nat McKitterick
McGraw-Hill World News

London.—For several months the Royal Air Force has haggled over which of its two favorite fighters—the Vickers-Supermarine Swift and the Hawker Hunter. Both have, indeed, the Hunter has been bought in greater numbers by the U. S. under the all-out postwar program in preference to the Swift, but until this week it has never been altogether clear which aircraft the RAF would support with large orders.

Now AVIATION WEEK has learned closely that the RAF has come down on the side of the new Swift F.4. The Swift F.4 is powered by a Rolls-Royce R.538 jet with afterburner rated at 9,200 lb. thrust. It can fly just 50 miles an hour faster. A large additional order for Swift F.4s is expected soon.

Some 375 are being built. A few Swift F.1s, however, are on order.

U. S. Taxes Down Swift In order to allow the RAF to make plans on the basis of firm delivery dates, the British government has asked Washington for assurance that the U. S. will not order to buy Swifts under the all those post-peace program except for delivery after 1956. That is a complete aboutface but will fill when the British will willing and eager to sell the Swift for dollars.

The U. S. turned down the Swift F.1 in favor of the Hawker Hunter on the basis of two flight squadrons western by USAF chief test pilot Maj. Gen. Al Boyd, who flew the Swift F.1 and the Hunter for Northrop.

Nothing in the RAF decision means the country is sure that the U. S. bought a pig-in-a-pair when it accepted the Hunter. The facts are that after extensive, independent flight tests and such rated evaluations by the RAF and the USAF, the U. S. chose the Hunter and the RAF favored the Swift (although Britain has ordered the Hunter, too). The RAF didn't make up its mind until

after the Swift F.4 first flew back in March.

The RAF favors the Swift over the Hunter largely for one reason: its extra range and therefore greater range. And otherwise RAF thinks the Swift is a slightly more flexible aircraft. Therefore, RAF means the Swift a slighter more flexible aircraft.

It is significant, however, that this year a step ahead of the Hunter, First Swift will be F.4s, which probably will be modified into F.4s. Second Swifts are now flying and possibly will appear in a formation at the RAF centenary review at Oulton July 15.

Problems were, the Swift an rougher

problem than the Hunter, requiring more maintenance. But Vickers Supermarine management has set up an American-type production network of 100 subcontractors in the neighborhood of Stevenage, Middlesex, England. There are now as many as 10000 men working at Hawker's plant, including plane builders Sheet Metal & Machine at Hatfield and Boulton Aircraft at Stevenage.

When he tested the Swift F.1 last November, Gen. Boyd was disturbed by wing stall. He was very impressed with the Hunter's handling characteristics. When he was assured by Hawker designer Sydney Green that the planned addition of tanks, concealed under the Hunter's wings, would bring up the range in line with the Swift's, Gen. Boyd gave the nod to the Hunter.

Another Swift-Swift designer Joe Smith, who had been asked to work out a plan for F.4 to eliminate Boyd's objection, wing losses appeared on the drawing board. The first flight was delayed for June 15 with a

Rolls-Royce DC-6B engine in a wheelhouse for inauguration Sept. 25.

CPA took delivery June 17 of the last

of four DC-6Bs on order. The aircraft will receive two more DC-6Bs in August and September. These cargo planes are rapidly convertible to stretch

clips, the RAF has been swaying over to the Swift.

The RAF decision is bound to have most effect on orders for Hawker Hunter. It has in hand orders for about 500, placed originally by the RAF. But the U. S. is financing 419 and making delivery by June 1955. That means a very considerable number of Hunter aircraft, selected by the RAF, will be in line to be delivered to NATO via the U. S. 500-aircraft program. In addition, the U. S. is financing part of the production of some 200 Hunter aircraft at Fokker in Holland and Rolls-Royce R.A. 7 Avons to go into them at Fokker's Nunspeet in Belgium.)

Two types of Hawker jets on order, one powered by R.A.7 Avons, eventually with afterburning, the other by Armstrong Siddeley Sapphire jets rated at 8,000 lb. thrust. All U. S. financed Hawker will have Avons. The last production Hawker is just coming off Hawker's production line at Severside near Blackpool.

CPA Plans DC-6B Flights to Hong Kong

Continental Pacific Airlines has started flying from Hong Kong to Vancouver and plans to extend the service to the Orient-South America navigation route for this September, using 84 passenger DC-6Bs.

CPA plans to fly over U. S. trans-Pacific route by going straight through from the Orient to South America via Vancouver, Mexico City, and Lima. First flight was slated for June 15 with a

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Flexibility, ease of operation, and the ability to refuel more than one plane at a time are among why the Flight Refueling, Inc. mid-air fueling system is proving to be as practical in military usage and why its later commercial use holds so much promise in the future.

Consisting of a simple hose and, easily installed or removed from the tanker aircraft, a fixed-shaped drogue with a reusable probe in the receiving plane, the system is simplicity itself. No special crew training is necessary. Pilot refuel contact is simpler than making a landing.



Flight Refueling, Inc. also makes fixed probe FR-1, drogue, flexible probe systems for landing drone aircraft; 1" to 4" in diameter. Available in all the common aircraft materials. FR-1 is a fixed probe system. FR-1 is a fixed probe system.



OVER 10 YEARS EXPERIENCE IN DEVELOPING PRESSURE FUELING SYSTEMS AND EQUIPMENT

AVIATION SAFETY



DIRECTORATE'S Flight Safety Research staff review an accident report.

AF Research Cuts Crash Rate

Flight safety specialists analyze accidents, educate crew members and suggest improved aircraft designs.

Arvinco Wren's safety culture, Alvarado McMillan, recently was granted achievement to visit Air Force's Flight Safety Research Directorate at Norton AFB, San Bernardino, Calif. In this story, Arvinco for the last two years, in three years, USAF's extensive research effort has resulted in a marked improvement in flying safety.

You will find the man at the head

of the Directorate of Flight Safety Research here at Norton AFB.

Rate Goes Down. A couple of days

ago, Gen. Robert J. O'Kelle

the safety director, and his staff of 14

researchers and physiologists, re

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And when this kind of saving is

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U.S. Air Force safety record gets

progressively better, there may be a

problem.

You will find the man at the head

of the Directorate of Flight Safety Research here at Norton AFB.

Rate Goes Down. A couple of days

ago, Gen. Robert J. O'Kelle

the safety director, and his staff of 14

researchers and physiologists, re

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and his broad powers to investigate.

Gen. Hoyt S. Vandenberg, Acting Chief of Staff, called in his top cause research at the time the investigation was being personally reviewed. The general was supporting flight safety, the aircraft corporation, and less involved with the aircraft manufacturers.

But those reported down the Vandenberg hierarchy has since the actual panel at least avoided any reply which has won for Flight Safety Research an enviable situation, and respect in Air Force, Army, and within Congress.

► **Round Robin.**—A day at the Directorate of Flight Safety Research starts with a round robin staff conference in which the specialists detail various types of accident reports which have come in during the night. The director or his deputy samples an immediate action to be taken in each case.

When an Air Force Wright staff writer or an AF public relations officer comes, the dir's deputies include such variety as:

- A student pilot who slipped into the propeller of a Piper Cub trailer in the ground and lost a hand.
- A Republic F-84 in a low level maneuver ran over the Gulf of Mexico during a rain, at the water and lost both engines.
- A major accident to a Navy R-530 (Fiber DO-5) reported by Navy losses with the contractor.
- A series of followup reports on accidents reported earlier.

► **Investigation.**—The investigation may require a team of specialists, including an airplane commander who is checked out in the type of craft which crashed, a pilot-instructor to check into the personal factors involved in the crash, a technical specialist from the company whose aircraft was involved, an engineer who will study structural factors.

► **Virtually Heads-Off.**—Theodore Q.



CARGO PLANE with specialist nach Fokker accident before crash crew cleanup.



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PRODUCTION

Forum Answers Heavy Press Questions

- Large forgings, castings pose many problems.
- SAE meeting analyzes them, looks into future.

The men who must help translate today's and tomorrow's aircraft and engine dreams from drawing board to costly reality are set for a panel discussion with designers, parts and materials suppliers, metallurgists and other industry personnel for a broad analysis of large forgings and castings.

Following panel members' spirited discussion which was part of the production forum held during the National Aerospace Meeting of the Society of Automotive Engineers, in New York.

Some of the more important questions and answers stated at the meeting are briefly here:

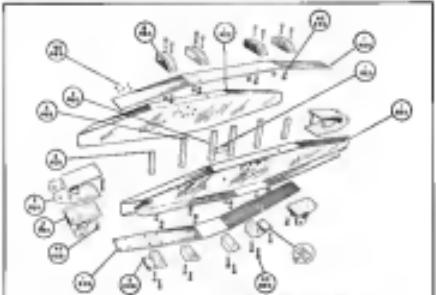
Forgings

- Is over-emphasis being placed on the use of large, light-weight forgings in aircraft?

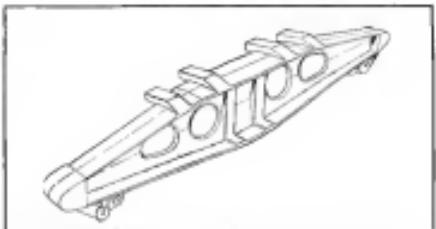
No—many people close to the problem believe that even greater emphasis is needed. In today's aircraft design and more performance has to be built into less and less space. This has called for new design thinking, new manufacturing techniques.

Many aircraft builders have turned to large forgings—such as the casting 16,000-ton press at Weyburn Gordon Co.—for a partial answer to these problems. Large forgings having high strength-to-weight ratios make possible designs not previously considered possible while at the same time experiencing many rate large savings in materials and materials handling from less machining and simplified assembly.

Many believe that the trend



HULPUP BEAM avionics support part, bolt and nuts, with \$444 estimated cost.



at large forgings would be the only practical way to manufacture modern aircraft in an emergency.

Are aircraft designers building in terms of large forgings and castings?

You would survey of 15 aircraft companies on the West Coast and in the South and mid-Atlantic regions and presented comment, as evidenced by designs actually on the drafting boards and in the procurement stage. Similar analysis is on the part of the Midwest and East Coast builders.

Many aircraft companies are and have been using the largest forgings and extrusions obtainable, and expect to use larger parts when the new presses are available.

Will aircraft designers be able to get from the large presses the kind of parts they want?

There will be limitations as what can be produced. At this stage, most aircraft and parts operators must base their estimates on extrapolation of data secured from the operation of the smaller presses.

On a 5,000-ton press operators have found that forgings of average complexity having 3,000 sq in projected area can be made. Aircraft forgings may be larger or smaller, depending on relative complexity.

Among the more urgent requirements of the aircraft designs are close dimensional tolerances, thinner webs,

New Problems

The forging and extrusion of super rare earth components, together with modern working requirements for new material and parts, will introduce new problems for industry users, as Aviation Week has reported in the past. These difficulties are being anticipated—new techniques have been developed and thinking prompted to help minimize solutions.

Aviation Week maintains an extensive coverage of these heavy press and casting problems with this presentation—attention stemming from industry engineers who are close to the present process and what can be done to take design and techniques to the full advantage of a new era in machine, aircraft and engine potential.

and smaller draft angles. Press operators face the fact that these factors tend to move in the same direction as forgings get larger. But they believe that better die lubricants, better die materials, more rigid press structures, use of the queching wheel technique, and other approaches—such as machining techniques, a rough well along with some short offset, the die factor, and use of larger forgings to reduce tolerances.

Aircraft designers must think at least five years ahead. They must continually ask for more than is presently available, in order to stimulate progress. An example of a recent advance—aluminum alloying from such thinking is the successful production of a tapered steel tube extrusion, with section 0.75 in. x 1 in., used in manufacturing propeller blades.

• How will the rigidity of the new large presses affect forging tolerances?

For most of large, rigidly held, by better die design, the new presses will provide better control of forging thickness and tolerance thickness variation from edge to center of the forging. This improvement will be particularly helpful in assisting development of such items as integrally stiffened, thin-walled wing panels and other similar parts.

• Can aircraft manufacturers afford the cost of buying dies if only a few parts are needed?

Dies can be amortized economically in many cases at as few as 25-30 sets of forgings. While parts and forgings are quoted in increments of sets (1 to 6 pieces), heated forging (hot roll) will frequently suffice to produce a blocker-type forging suitable for the first few pieces. Such forgings offer many advantages over forging out of slab because of better grain flow and properties, and less machining.

One forging vendor claims possible results with cast iron die that revolutionized the cost, for producing small quantities of blocker-type forgings. This method, if successful, promises even lower tooling costs for prototype quantities.

• Will the use of higher die temperatures during forging have a beneficial effect on the probability of large, light-weight parts?

The temperature of at least 1,000°F is recommended. For many thin sections, die temperatures as close as possible to stock temperatures are desirable. At present, a practical top limit appears to be about 1,600°F. Above that,

large blocks require better time temperature curves in the mold materials that are currently available, if close

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tolerances, nor to be held. Pipe operators feel that maximum tolerances must be close to the drawing because it is to be noted, and that available sizes must be much greater than the 3,000 ft mentioned, if they are to be useful for the large press forgings.

* What is being done about getting actual sizes on the books for parts to be produced in the large press?

Pipe operators are working with designers and builders to promote the development of large forging and extrusion applications. The Air Force, too, is urging builders to utilize the new tools.

It is reported that the Air Force is prepared to undertake development research of metallic forms, thus assuring that place production schedules would be set by the use of built-up structures, should difficulties arise in obtaining the large integral parts.

Several operators report that they are overhauled at present equipment which parts a large number of quantities and delivers schedules. The new presses will be utilized immediately on existing products to relieve this bottleneck.

Another important feature will be the combining into one piece of two or more large forgings your present separate parts. Many of the designs are easily worked out for the use of the 15,000 ton press. Some are found to be too large, and have to be split. On such items, re-engineering into a single large forging is attractive because it requires no extra design changes and will save weight by eliminating one or more parts.

* Will raw material of adequate quality and size be available?

Aircraft builders are looking for something better than has been available in the past. All the major producers of rod and bar are working on the problem and some success seems to have already been achieved.

* Will they be enough raw material for the maximum capacity of the presses to produce forgings and extrusions?

Magnesium producing capacity will prove adequate. Aluminum producing capacity is being rapidly expanded, according to reports. A current scarcity of forging quality rod and bar is temporary.

* Assuming sufficient pig is available, what about facilities for converting it to ingots and shapes?

There are two main aspects to this problem—first, the making of a sound ingot; and second, transmutation into shapes of maximum quality by the proper type and amount of heat.

One producer that much ingot is producing an ingot up to 30 in. in diameter, which is virtually free of gas and porosity, as determined by gas

analysis, micro and macro-examination, and some testing.

Another producer states that he has been working on the problem for a number of years and has now produced several ingots of 145 and 238 in. up to 6,000 lb. He has produced ingots up to 9,000 lb experimentally, and larger ingots are in the program.

Another producer believes that forged ingots can be made by ingot practice in reducing to weight but, not forging. This company has done some work in rolling 1500 square weight, using drafts of from 5 in. down to 1 in. It has been found that the lighter drafts work only the surface, stretch the center, and tend to produce annealed bars. The conclusion is that heavy drafts and no much total reduction are desirable as necessary for sound ingots.

The Air Force contract is being pursued to cover experimentation in and development of ways to reduce ingots to desired shapes and sizes, with high quality. The methods to be studied include stretching, cross-rolling, engaging, drawing, rolling and extruding, in various combinations. It is expected that this work will be complete by the time the new presses are ready.

* Why don't more use made of blanks cast to rough shape, then finish forged to final shape?

This has been done, but it is a question of economy and quality. Present methods are that the forgings made this way will not be as strong or as durable as if they were forged from bar.

This is applied by one producer of magnesium forgings that has not the material has a tensile strength of 36,000 psi, yield strength of 12,000 psi, and a 6% elongation and bar forged with a 10% reduction in the material shows 37,000 psi tensile strength, 16,000 psi yield strength and 15% elongation. The forged bar has cast shape 44,500 psi tensile strength, 30,100 psi yield strength, and 16% elongation.

* Which makes the best forgings, extruded or rolled stock?

The forging configuration might suggest that one in the other would be better according to one producer of forgings. Another producer states that it makes no difference.

Problems of extruded bar fuel that solution often is as high as 35.3 in. desirable. On this basis, the capacity of present extrusion equipment places a limit on the use of extruded rod which could be made with this solution. New extrusion equipment under construction will eliminate this restriction.

Castings

* What difficulties are experienced in casting magnesium with thin wall metal thicknesses of 2512 type with 3% tungsten?

Smoothness and porosity do not pose too much of a problem. There is an odd effect in which the grain grows in a direction perpendicular to the mold wall. In some processes this has been found not harmful to performance.

The material is susceptible to freezing which presents a problem when gas must be cut.

* What can be done to reduce the tendency of aluminum casting?

Good aluminum casting of consistent quality are being made, but consistency rules must be observed first, do not ask the producer to cut any casting from his inventory. The engineering people at the customer's plant and at the factory should get together and determine what is the best way to go about it in the present situation.

Second, quality casting should be made by a producer with adequate equipment, experience and personnel. High strength casting alloys are more difficult to handle and require adequate control. For instance, proper use of X-ray inspection in the foundry will serve to show up the porosity, and help in determining the cause of imperfections. Such information properly applied will ensure the quality foundry.

* Why do extrusions sometimes have lower properties than the test bars, or even lower bars are found in a properly cast ingot?

Test bars and ingots can be cast under different conditions than approach the mold. On the other hand, a shape can have more difficult configuration changes in section, than will the all of which will be higher risk to produce a sound part. However a reputable foundry will see to it that the design and after selection are proper and that methods are used which will produce a part in which the relationship between bar and casting is consistent and dependable.

* What is the use for castings in magnesium casting?

It depends on the part and the casting method used. For example, in magnesium casting in England is about 7 ft long, with an average section of 2 in. More ingot sizes are manufactured today in the 100-150 lb range. Another large casting is a 1,000 lb base for a radar station.

* What are the maximum wall thicknesses which can be obtained—can we get as low as 400 μ ?

It is reported that a California company is having some success in this regard. A 2 ft-square magnesium panel has been cast with walls averaging 300 μ . *Aerospace Week* Dec. 29, 1952, p. 31, reported a magnesium casting which was 100 μ thick.

High strength bars have not yet been successfully cast with a 400 μ wall, using several processes. But it is reported that using the frame extrusion process, 14 in. dia rings with 1 in. walls have



HUGE INGOTS will be key considerations in heavy press program products. Big metal checks must be free of gas, porosity



CANOPY TUBE is example of magnesium casting. Part is about 20 by 20 in., weight 60 lb, has 1 in. wall



WINDOW FRAME is another example of casting magnesium with thin wall. Metal thickness is 3/16 in., weight 21 lb.

been successfully made, and 20 in. dia. rings are made with walls only slightly over 1 in. In SAE 4140 and Types 316 and 410 stainless, such rings can be made up to 16 in. in diameter. • What about tolerances on these ring castings?

The higher the casting temperature required, the more difficult it is to hold tolerances. It is not just a matter of shrinkage. It is also a question of finding suitable methods and tolerances which will withstand the high temperatures.

The foundry experts believe this is best done up to 2 in. in diameter with a tolerance of $\pm \frac{1}{16}$ in. (0.0625). Another foundry is making 36 in. dia. ring to

0.03 in., but wall thickness is greater, 1 in., casting material being allowed on the inside diameter.

Using the latest technology or plastic processes, very close tolerances and thin walls are possible, although at present the cost of such castings is limited. • Here are some of these limitations in wall thickness and tolerances being overcome:

• By machining, or many times. One machining method involves cutting followed by rolling to thinner walls and to shape.

• It is conceivable to weld aluminum and stainless castings for aircraft wall thicknesses.

Welding is permissible in few areas

now, using the Helix process. • Gas high alloy castings is currently being explored.

Using the latest technology or plastic processes, very close tolerances and thin walls are possible, although at present the cost of such castings is limited.

• What is the status on Zylon high temperature non-torsion castings?

It is presently the best method, according to one user. However, the influence of extreme visual inspection should not be overlooked. Why Zylon is not more widely used is unknown. The answer must be in the cost of aluminum castings causing the user by requiring unimportant power and superfluous fields.

• Where do castings find their most important field in aircraft?

Without a doubt, at present, in aircraft engines. There are high grade aircraft quality parts. A tremendous field is developing for standard "H" grade castings in the field of heated airfoil overheat use, such as seen in the graded missile service. —18

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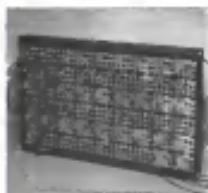
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Magnetic Blocks Aid Computer Design

Stacked magnetic building blocks for stacking up programs were invented recently by a scientist at a meeting at the Naval Ordnance Laboratory, Silver Spring, Md.

They look somewhat like children's building blocks and can be arranged rapidly in any desired performance pattern, the scientist was told.

The blocks, or Magnetic Design Elements, were developed by Mosecon Electronics Corp. They are described as completely flexible, basic components which can be used to build quickly the circuit arithmetic, program, control and memory sections of digital computers. The blocks are iron with copper.

They can be employed for both serial and parallel systems, ranging from simple logic and basic counters to large-scale general purpose computers and digital differential analyzers, according to the firm.

The elements contain no electron tubes or transistors. They are not in an astatic type form for maximum resistance to shock and environmental conditions and have themselves to withstand production, for applications "where absolute inaccuracy is a Wright ... one of primary importance," the company says.

Use of the blocks will lengthen the

solid life of computers, as they can be stacked several to meet new demands on the computer. The time cycle of design and construction of computers can be shortened to weeks, days and hours, instead of years, since these blocks are the foundation of computing systems, the company claims.

Magnetic Electronics Corp., 47 W Water St., St. Paul 1, Minn.

New Stainless Alloy Is Harder, Non-Galling

A new stainless steel alloy—V2B—has been announced by Cooper-Standard Corp., Hillside, N.J. The new

steel is reported to combine high hardness, non-galling characteristics and superior corrosion resistance.

It is a heat-treatable 18-8 type, containing copper, molybdenum, silicon and a very small amount of boron. It is reported readily heat-treatable in the quenched annealed state and may be heat-treated by a low temperature heat treatment, which produces no distortion and only a light surface decarburization, readily removed.

In annealed condition, the material is said weldable, using special V2B welding.

The alloy does not average 18 percent temperature, it is said. It can be produced in both cast and wrought form.

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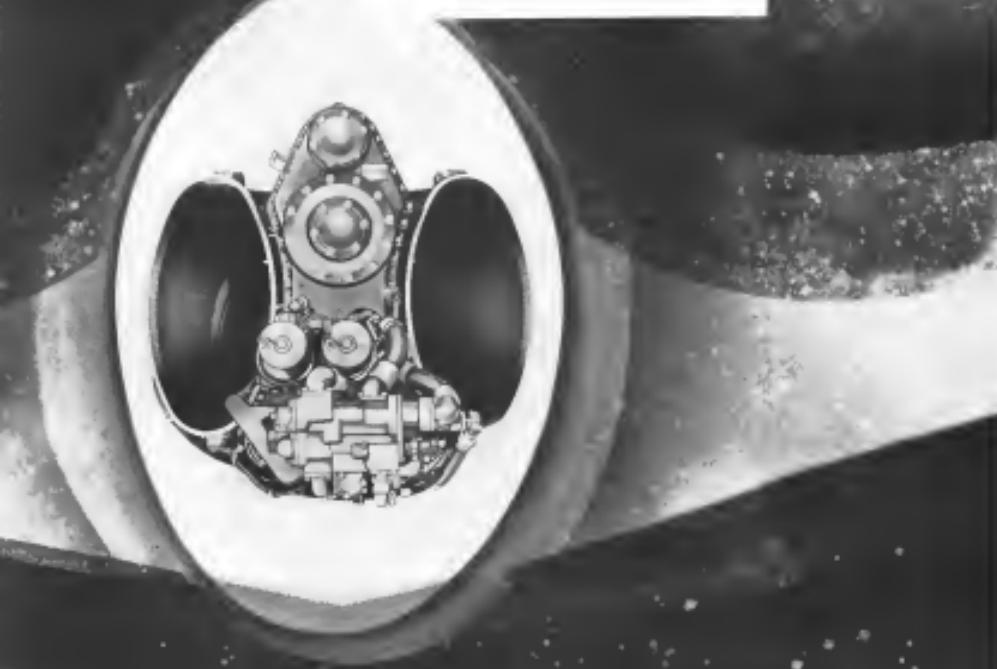
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New jet engine designs further reduce frontal area



With their introduction of the first axial-flow jet engine over ten years ago, Westinghouse engineers expanded their efforts to reduce aerodynamic drag to an absolute minimum. Continued designing and testing net with outstanding success on the J34 engine, first in the class with the smallest frontal area per pound of thrust . . . permitting the first two-jet aircraft design. The unequal performance of twin-jet planes in Korea has put real meaning in that award.

While the J34 was writing jet history in combat, Westinghouse had new pencil-thin engines in their test cells . . . new designs for a more powerful jet engine that promised even greater latitude in plane design. Today, those designs have made possible the J46 with the smallest frontal area ratio of any transonic engine.

Rushing that even projecting rivet heads can have effect on the speed of jet aircraft, Westinghouse engineers know that they must respect every aerodynamic factor. That is why they have maintained leadership in the development of axial flow engines . . . why they have designed jet engines smaller in diameter for given power output than any other manufacturer. That is why they have acquired a wealth of jet engineering and designing knowledge that will prove invaluable to commercial aircraft tomorrow. Westinghouse Electric Corporation, Aviation Gas Turbine Division, Philadelphia 13, Pennsylvania.

J-3494-A



Final Assembly- Shown here in the last stages of assembly is the Westinghouse J46 . . . world's most powerful jet engine, fully qualified for production.

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LONG PRODUCTION LINE for samples and intricate avionics assemblies at Hughes' large Cedar City, Utah, plant depends on controlled flow of parts and sub-assemblies.

Hughes Aircraft Co. Accents the New

Young management, not bound by precedent, is willing to try novel ways and finds many of them pay off.

By Philip Klass

Cedar City, Utah—There is a freshness of approach and a willingness to try the new at Hughes Aircraft Co. which the visitor here quickly senses. The tangible evidence comes in the form of the novel manufacturing techniques employed throughout the plant, well not just where Hughes builds its complex aerospace fire control systems.

Less tangible, but more the key parameter, are corporate policies and philosophies espoused in Avionics West by some of the top men at Hughes. All that.

For example, HAC does not insist the use of conventional techniques be the basis of its control nation and aerospace needs. The techniques of "closed loops" and "breakfast" are applied widely to the organization of Hughes' manufacturing and engineering operations.

One interesting company practice is to bring skilled field engineers back to Cedar City and put them into design and development engineering groups.

In this way field engineers can apply their knowledge of field usage problems to new equipment designs.

An interesting Hughes philosophy is the associated company policy of recognizing contributions of outstanding individual scientific workers with pay and salary equal to those who hold technical administrative positions.

► **The Results.** Fresh and vigorous management at HAC is a product of sound financials.

It would be naive to suggest that Hughes' results have come from offices. It has pioneered techniques that have already brought old-line electronics manufacturers to Cedar City for a look see.

► **Field management.** The young management here which allowed Hughes to put his company out willing and eager to try new ideas.

► **Source of ideas.** The scientific and pedagogic people at Hughes had come from a combination of U. S. industry, going HAC a combination of U. S.-controlled aerospace firms. Careful selection of the team here at Hughes turned out to be a good idea.

► **Whizball: Multitouchstone flow**

and Hughes provided HAC with the dollar needed to try out its ideas.

► **Shows Outside Influence.** Hughes' engineers show the influence of the "industrial plant manager" of some of its units. The warehousing, assembly and materials-handling techniques mirror of the automotive industry. The concern shown in HAC's research and development lab resembles that in the research lab of Bell Telephone Co. and General Electric. Solid here, the concern is quality improvement and management and their organ is the Harvard School of Business Administration.

It would be naive to suggest that Hughes' results have come from offices. It has pioneered techniques that have already brought old-line electronics manufacturers to Cedar City for a look see.

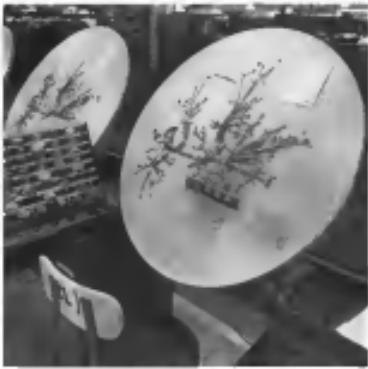
► **Inventory.** In a servo system can come instability. An equivalent "phase lag" in manufacturing operations results in high spot-on and low output. The equivalent phase lag is the interval between the instant that a machine or tool first begins to slip out of tolerance and the time that the resulting defective parts are first detected at a downstream inspection station and traced back to the offending machine or operator.

► **Whizball: Multitouchstone flow**



PRECISION

Inspection of fine-tolerance parts on the shop floor.



NEW TWIST

In casting electrical lenses in moldable plastic base that cuts segment production time sharply.



INVENTORY

Central cells for stamping, a typical aerospace fire control system, carry about 15,000 parts.



SIP BORING

Machine is one of foreign tools used.

Hughes has tightened this loop by placing expensive gages and test fixtures on the shop floor so that precision manufacture operators can inspect their work as soon as they take it off their "line checks." "You have to believe your operators at the same time you make them," is the way that R. B. Burkhardt puts it. Burkhardt is plant manager of the Electronics Manufacturing division which turns out aerospace fire control systems.

Burkhardt designs simply with those in industry who are ahead to give part

room gages to machine operators. If they will damage or mislead them, HAC maintains gage accuracy by removing all gages at the end of each shift and cleaning them again at startup. After they are gages are used and then cleaned, the same gages are used the following day, according to Burkhardt.

On-the-job inspection and a strict total quality control program, both initiated about a year ago, have cut overall gageage to around 30-35 dollars of field machine shop output, Burkhardt reports.

► **Tooling in Production.** "We learned the hard way that all tools that you can't inspect quality into a product, you have to build it in," Burkhardt says. Some of the tools used required to fabricate the aerospace parts must be designed for tolerances of 20-milimeters or less.

Many of the Hughes machine tools have been imported from Switzerland and Germany and include Sip hydrostatic and rolling and rolling machines, Tissi automatic screw machines and Hobart grinders. Many of the machines are



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Oddly enough, the metal-forming process first used to produce aircraft-plane structures helped put the "teeth" into World War II. The Microcast Process was developed as the turbo superchargers of high-flying B-17s and B-24s that provided extra speed and longer range were produced fast from high-quality wire slugs by the unique Microcast Process.

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specify built to Hughes specifications, it gains no price.

Hughes pointed out a Fellow's first pitch goes slower, but by identifying fit and assembly, an integrated cost can, for each flight, be had a 2.5% premium. To provide the appropriate shield, Hughes said, the premium gear slugs is reported not only half as much speed. Hughes emphasized:

► **Information Feedback**—Hughes has applied the same tight control closed loop philosophy to the assembly lines while major components are assembled and tested.

There is a test-expansion circuit at the end of each assembly line.

When a sub-line unit shows up, the information circuit immediately sends a fine signal from the test station and the entire was made. Rapid feedback of information allows the assembly to be sure quickly checks up the trouble, Hughes says.

The assembly lines are built in a variety of lengths from a single standard model to large work stations developed by Hughes Aircraft. The work stations can be provided with either a flat top working surface or a track to accommodate flat sheeted dishes which carry the work from one station to the next. The latter can be equipped with several sets of "traveling" work stations to accommodate a variety of work pieces.

Racks for storage and receiver transmission are assembled in large frames intended for overhead travel.

► **Control to Rapid Change**—Hughes has built its assembly lines to handle the frequent circuit changes and improve yields. When engineers change an inherent in the fast moving line control business.

The predominance of these changes are what Parkhurst calls "hot-type changes"—series circuit changes that can usually be simulated in the line less than eight hours after the tool line.

► **Scheduling and Bookkeeping**—About 1,500 parts go into an intercooler line control system and this poses a serious flow and scheduling problem.

The Hughes solution is to set up an assembly line and immediately split the assembly line. A two-to-three week supply of every part needed in a particular line is stored here in individual bins and the assembly line is reassembled with these from the assembly area. This can be repeated in one week, from general inventory as needed.

As a result of its close monitor control, IAC action on a five-fold incentive bonus is a fact.

Knocking financial tabs on 10,000 parts could be a back-breaking effort, but it isn't at Hughes. An analysis showed that about 55% of these parts represented only 10% of the total material costs. So Hughes limits any part costing

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two dollars or less as "hot stock" work like most manufacturers turn out, tools, and washers. The 15% of the parts that cost more than two dollars are handled in a controlled house and reconditioned as needed.

► **Using Production Techniques** Putting a newly developed system into production normally presents lots of headaches in engineering and manufacturing departments. Manufacturing people usually add, for many changes in design to make the equipment easier to produce. These changes frequently hurt system performance, and the development engineers must be called in to redesign circuitry to get performance back up to specification.

Hughes solves this problem by having at a local pilot production line operated in its research and development labs prior to full-scale production.

The pilot line gives production people an opportunity to solve the fabrication problems, suggest design changes, and get familiar with the new system. Lab engineers get a chance to make design changes without the disruptions that would occur if tried in full-scale production.

As pilot production begins off, the manufacturing people on loan to the labs return to the manufacturing division with knowledge of the production job they are soon to tackle and some of the problems they'll face.

► **Speedup**—Even before the pilot run is complete in the final design lab, Hughes has begun to release drawings to its manufacturing division for procurement of parts of the building of special tooling and equipment.

This is a calculated risk, and results in some trapping. However HAC officials say that it reduces by many months the long gestation period otherwise required to develop and put new complex systems into production.

Hughes also speeds up flight testing of experimental equipment by operating more than 20 aircraft, many of them jets, from a runway adjoining the R & D labs. On occasion, Hughes engineers have driven past the laboratory in borrowed cars to get the first of these borrowed aircrafts into a C-47, using auxiliary ventilation fans. Dr. R. P. Johnson told Aviation Week Johnson is associate director of the R & D labs. When equipment troubles develop, the airplane can be triced onto the lab yard and the technical experts from the lab are immediately available for trouble-shooting.

► **R & D Labs**—The fire control systems built by the Electronics Manufacturing division here, and the Falcon (air-to-air) missile to be (as of now) built at the Texas, Ark., missile plant, were developed and designed in the 3,000-square-foot Research and Development laboratories. Dr. Dean E. Woldridge,

What Hughes Aircraft Research and



DIGITAL COMPUTER

The advanced interface the control system has interface to into an magnetic memory drum.



MISSILE CHARACTERISTICS

are recorded by the system in a steering and laboratory.



EXPERIMENTAL SHOP

there is one of several working models and development engineers in this work

Development Engineers Are Doing



SIMULATOR "FLIES"

Let control problem in laboratory be work out, do tests on development of advanced type of equipment



WRITING SPEED

of an experimental article by storage tube is seen used by engineers in electronic tube laboratory.



FIRE CONTROL

system components for South African Airline F16

formally of Bell Telephone Labs, is vice president and director of the lab. Dr. Johnson is next in command.

The scope of the division's activities is broader than its name suggests. In addition to research and development, the R & D labs have responsibility for production design and system engineering. Until recently, field engineering work was a R & D labs responsibility but it has now been made a separate company division.

The lab operates on a semi-autonomous basis. They have their own personnel and purchasing departments as well as the large model shop to conduct experimental and pilot line experiments.

The two largest technical groups within the R & D lab might be called "systems" groups. The guided missile lab is responsible for the complete development and design of the Falcon, the rocket lab has similar responsibilities for intercontinental fire control systems. These other components—the aircraft, jet aircraft, Hermann, etc., and the nearly 1000 Marquardt—plus the fact the founders of knowledge in these fields, develop new designs and support the weapon system group.

► **Weapons Systems Lab**—The missile lab is self-driven and organized on the basis of professional skills (i.e. aerodynamics, propulsion, electronics, controls, etc.). Dr. Johnson runs.

In the fast control lab, where several different systems are under development at any one time, a project type of organization is used. Johnson runs Teams of men with aerodynamic, mechanical, electronic, and other skills are assembled to work on specific fire control system projects.

► **Research Labs**—Hughes realizes that major improvements in missile and fire control performance frequently cause fire lead or fire control system breakthroughs. This explains the existence of 31000-square-foot laboratories, equipped alternators, and waveguide laboratories. But there are other centers.

The advanced nature of HAC's work means that its needs are frequently years ahead of component development by outside component manufacturers. Thus too, missile and fire control needs are sometimes so specialized, and the facilities so limited by comparison to radio-TV, that manufacturers are as willing to develop suitable devices or components.

► **Electron Tube Lab** is currently investigating "vacuumless" amplifiers, a comparatively new technique for multiplying microwave energy through the interaction of electron streams with electric and magnetic fields. The lab is also working in making that action more rapid to permit the use of traveling wave tubes to permit their use in high-speed circuit breaker and mixer as radio and missile



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gradient. This laboratory is putting considerable effort into storage-type codeless wave tubes to provide better radar performance in intercepting the control aircraft.

► **Advanced Electronics** lab. activities are broad in scope and include research in semi-conductors, airborne data processing, communication systems, magnetic components, and solid-state basic techniques.

One notable program is the development of an airborne digital computer which can be used for navigation, fire control, and other aerial "problems." The object is to design a single universal computer which can replace several old type airmail computers each of which must be tailored to one specific task. Advantages of airborne digital computers were described in *Aerospace Week*, June 29, 1952, p. 27.

► **Microwave** lab. recently organized, performs basic investigations on microwave propagation characteristics and on microwave techniques for use in missile guidance and fire control systems.

► **Transforming Knowledge**—by supplying technical channels for transmitting know how from the research labs to the test labs. Hughes recently transferred personnel from one lab to another. Dr. Johnson reports. He and a group of uncommissioned specialists from the advanced electronics lab who were assigned to missile and fire control labs as well as providing their technical knowledge to the test labs.

The Johnson admits that it is now time to begin to get the systems lab to reduce their specialists to return to their home labs.

► **Work in Commercial Field**—The R. & D. lab. is currently studying the electronic data handling needs of order trial, financial and commercial concerns.

The object is to design a line of equipment suitable for their use yet sufficiently versatile to find wide application.

Hughes officials think there is a bright industrial future for the micro-mechanics and digital computers—know how gained in missile and fire control work.

The guidance studies which HAC is currently conducting commercially were developed in the R. & D. lab. Work on precision insulation is now math in progress there.

► **Role of Field Engineering**—Hughes gives its field engineering department a broad and important role of company headquarters here, in addition to the customer's use in the field. Local R. & D. teams, regional offices.

► **Feedback of Information**—in research performance in the field to up-gradate better design.

► **Enhancing Design of Test Equipment**

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for maintenance at the field.
► Writing technical manuals and in-
struction books.

► Conducting technical schools to train
aircraft personnel in the use and main-
tenance of HAC equipment.

► Preparation of classification instruc-
tions and field modification lists.

HAC field engineers also perform the
usual technical liaison at previous man-
ufacturers plants where Hughes equip-
ment is being installed and is used
throughout the world when Hughes
engaged contractors are located.

► Participate on Pro-Flight-E. M. Boy-
kin who heads HAC's Field Service
and Support division places great em-
phasis on the information feedback
of his group. A Hughes field engi-
neer must have a degree in electrical
engineering or physics, Boykin says, be-
cause men are needed who are more
than mechanics.

Hughes field engineers must have the
technical nerve to propose the means
of acquisition, bidding and to review
new design changes for improved per-
formance. In some cases, field engineers
are transferred back to the R & D lab
and assigned to preliminary design
groups where these field engineers can
be used to shape the design of new
equipment, Boykin says.

Hughes doesn't allow field reports on
engineering failures to leakage to the
field engineering department. Copies
are quickly made and distributed to the
appropriate engineering, manufac-
turing and quality control sections for ac-
tion.

Where a product or component from
an outside vendor shows up not to fit
specifications, Hughes' rigidity, the
Vendor's name will be dropped from
an approved vendor's list. This prevents
other groups within HAC from so
knowledge using a component that
supersedes him shown to be unsat-
isfactory.

Within the past several months,
Hughes has set up a system to log
component failures in the R & D lab
to provide its design groups with easy ac-
cess to information concerning the
failure of individual components.
If a development engineer has a choice of
many either of two tube types as a
particular current and wants to know
which type has the better field service
record, he can turn to the R & D lab
for a quick and quantitative review
of his question.

► Unusual Philosophies—"The mem-
bership objective of all Field Test Equip-
ment sections is to make every field
test equipment unnecessary," Boykin
told Aviation Week. Field engineers
work with his sections to do just that
during the design of field control and
monitor equipment to suggest ways of
incorporating self-diagnosing or fault-in-

test elements while the design is still
in the planning and prototype con-
struction stages.

In the FMSD or F-94C, a round
silver case or the solar operator can
give his Hughes for control system a
quick, on-flight or in-flight check on
any fault in the system. Boykin says. By
positioning a selector switch to each of
15 different positions, the operator can
check a like number of field system
signals. A memory card, positioned to
the selector switch, shows the relo-
cation that should be obtained in each
switch position.

In the F-94D, which has no separ-
ate radio operator, this button series is
mounted in the fuselage and is accessible
only on the ground.

► Interim Test Equipment—Mr. Gen
Donald L. Parr, vice commander of the
SAC Air Research and Develop-
ment Command, recently made a pilot
to the various units to get field test
units out on time. *Aviation Week*,
Aug. 27, 1957, p. 60.

The difficulty is this. If testers are
designed early in the program, they are
inevitably abandoned by intermediate
changes in the equipment which they
are designed to test. If the tester de-
signs a delayed until the equipment de-
sign is finished, the testers will be big
equipment by a year or more.

The Hughes solution is to build per
manent field testers to hold the fort
knowing field testers to hold the fort
knowing field testers to hold the fort



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Controllable inductors, called the Type
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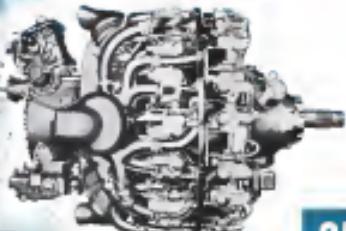
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during the first few months that the equipment is out in the field. The test center is started after the equipment design is frozen.

► **Design.** With Complexity—The HAC's hydraulics system used in the F-86A, F-94C and F-46D is complex, even in an avionics electronic. Each system consists of some 35 separate "block boxes" comprising over 200 vacuum tubes and thousands of associated parts. The Air Force had learned to expect extreme complexity in its hardware but it must now learn to cope with even possible extreme complexity in its own expertise.

HAC's field engineering groups has scheduled nearly 300 Air Force bases for circuit breaker stations in a series of 27 week courses. Some of men, from technical training commands, have returned to their offices to set up schools for working-level instructors. Others have returned to operating organizations to set up suitable maintenance facilities.

Hughes doesn't underestimate the problem the military faces in keeping its new fire control equipment operating. A HAC study indicates that an average of 14 million breakdowns per autocorrector will be needed. If the 1000 sets can provide the number and power adequate quantity, HAC officials consider, given that the equipment will be operated when needed. They cite, for example, the results of experimental flight tests on a current HAC system at Eglin AFB, Fla. Given adequate maintenance, that system could log 10 million without failure, a HAC official says.



New Narco DME

In the field of growing interest in distance measuring equipment, National Avionics Corp. (NAC) of Andover, Pa., has announced its own entry in the DME field. The Narco set, which weighs 30 lb., is designed for executive and corporate type aircraft as well as for military use.

The new DME uses a poster-type indicator with a 3 200-mile range coarse scale that can be switched to a 2-20 mile scale for approach. Narco says recent flight tests have shown its DME

AIRPORT WIRE, June 29, 1955



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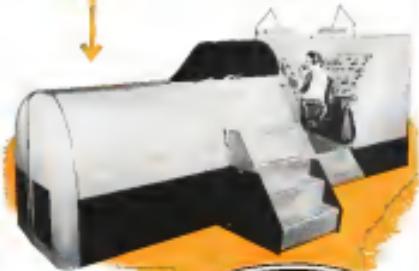
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In fact an error of less than 2% on the error scale and less than one half mile error on the approach scale.

Dragons Disappear. The North American DME is mounted in a half-STR case and requires no external ac power supply. Transistor frequency is repeat installed and polar timing is obtained from magnetoresistive delay lines. North American says its DME is the first with an 82-pinch range at low as 20 miles. The new DME uses plug-in type of construction and is available with either standard or Avco ruggedized.

A special shelling light may be used for positive identification of a transponder associated with a known VOR.

The North set was developed by specifications prepared by the Civil Denotators. Avco received under a program sponsored by the Air Navigation Development Board. North says its DME will be available later this year.

FILTER CENTER
33412

Autopilot Problem on F-5D—The military says that North American Aviation introduced in the F-5D electronic power control system is not reliable. The system is in flight instruments and caused numerous reliability problems. The valve reportedly isolates him which upset the persona autopilot. It 5 autopilot compatibility.

Wescon Link Program—Seventeen technical sessions and approximately 85 technical papers have been scheduled for the Western Electronic Show and Convention to be held Aug. 19-25 in San Francisco. The program will include two sessions on vacuum tubes, transistors, electron devices, capacitors and computers. There will be one session each on avionic electronics, microwave techniques, sensor, teleferencing, automation, fire-control and nuclear radiation measurements.

Making Jets a Better Target—Lockheed finds that the jet fighters which serve as training targets for its solar equipped F-104s are not as difficult to spot on the F-104's solar scope as anticipated. To help the situation, Lockheed is experimenting with radar transponder beacon and corner reflection being from the tip tanks of its target planes to strengthen their radar return.

UH-1 Tumble Power—The military, which is watching the airborne communications to the UH-1 riggers, is still plagued by propagation troubles when high-speed antennas are used. Observe report that propagation is most least at times, only to be followed by severe and unpredictable fading. —PK

AIRPORT WEEK June 29, 1962



GIANT ALUMINUM FORGINGS SPEED PRODUCTION OF MCDONNELL DEMON

A series of forgings from Alcoa and McDonnell Aircraft Corporation developed the aircraft's keynotes for the F3H-1 Demon. Two 350-pound Alcoa forgings attach the wings to the fuselage, "carrying-through" the tremendous loads imposed by high-speed flight.

Earlier designs embodied a series of complex structures for this spar section. Fabrication was time-consuming and expensive... produced overweight spar sections. The Alcoa forgings save weight, time and cost.

One of the first aviation applications produced on this Alcoa-open

and 15,000-ton press, McDonnell's 350-pound forgings point the way to lighter savings for other aircraft manufacturers. Sheer size of the press permits larger and more intricate forgings to be produced—with complex air frame subassemblies formed in a single unit.

For additional information on that press... or any of Alcoa's facilities, contact your nearest Alcoa sales office—listed under "Alcoa" in your telephone directory—or write: Aluminum Company of America, 1806-A Alcoa Building, Pittsburgh 19, Pennsylvania.

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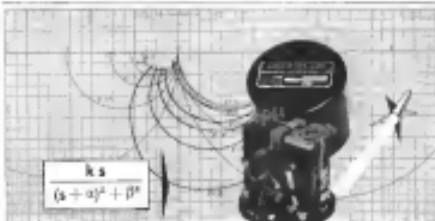
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degrees/min. 1/10



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Valve Reconditioner

Black & Decker has developed a compact little machine designed to speed valve reconditioning in airline engine overhaul activities.

In addition to speed, emphasis has been placed on greater flexibility, improved cooling methods and higher efficiency in valve refacing operations.

The automatic feature, an angle grinding attachment which permits quick and accurate grinding of valve stems, seats and valves seats. A clamp locates the stem or valve in place in seconds, the valve seated. The carbide-grain valve heads up to 4 inches, valve stems to 10 in., and valve angles from 0 to 90 deg. It removes grinds at all angles.

The cooling system provides wet grinding at both wheel's on the unit, coarse control and an improved coolant system. Smooth grinding, high-speed feed rates and simplified controls are among other advantages claimed for the unit.

ALSO ON THE MARKET

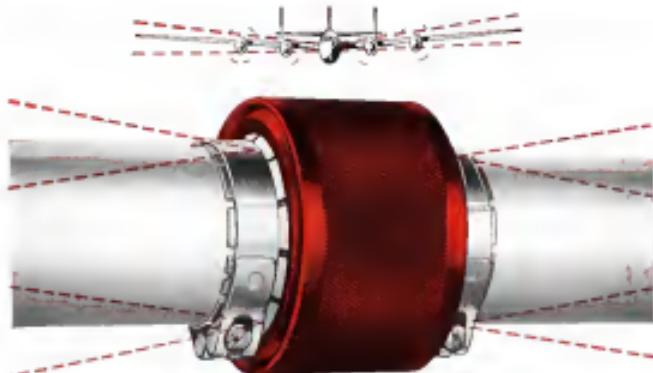
Solvent degreasers for production lines where speed is essential is practically non-toxic and non-inflammable, doesn't require special safety clothing and ventilating equipment. Manufactured by a leading producer for cleaning of instruments, it has no adverse effects on insulation. Becker & Co., Inc., Dept. 248, 2016 Columbia Ave., Indianapolis 7.

Press brake of 40-ton capacity that forms sheet up to 2-in. thick and 4-ft wide, is said to be excellent for working to close tolerances and on certain operations—Stevens Weller Corp., Machinery Division, Tinley Park, Ill.

High-tensile-strength adhesive with outstanding strength and durability characteristics has been developed in cooperation with MIL-A-4548, AFM48, AFM7A and ANS 1665. It cures without heat and will not decay collagen fibers as do cements which are not oil proof; is a resinous type in soft state, and adheres well to all—Chemical Development Corp., Dracut, Mass.

The Aeroquip Flex Joint

FIRST TO PERMIT SUCCESSFUL FLEXING
OF RIGID FUEL LINES



Another "first" for Aeroquip! The new Aeroquip Flex Joint permits flexing of rigid fuel lines in aircraft while maintaining a positive, fluid tight seal. Of simple, hollow-tube design, the Flex Joint allows fueling to "green" 100% plus or minus, and accommodates wing deflections, vibration, therm-expansion, and contraction allowances. It is compact, light in weight and can be installed in confined areas without oper-

ation tools . . . without precise cutting of tubing or fueling fittings. Initial tests on the Flex Joint have been conducted ranging from -45° F. to +140° F., from flexing, bending and stretching, to heating with pressure and vacuum, and demonstrating ultimate strength by breaking. The test has been conducted along the lines laid down by the M.A.C. Descriptive literature is available; please write.

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of a vice president to the post is made. Engineering consultants are studying the proper design and location of NWA's maintenance and overhaul facilities, now located at Holoman Field, 30 miles. Their recommendations will be submitted by Oct. 31. Possibility of moving to Seattle or Minneapolis-St. Paul Airport was reported in *Aviation Week* (June 15, p. 42).

Loftleidir Cuts Fares, Wins Heavy Loads

Lower-than-expected fares, free load, longer layovers, however, fail to compensate to and from separate plan ached and outright accusations of airline experts are driving high load factors in Loftleidir, the Icelandic Air Lines, as its soon will consider DC-4 intercity flights between New York and Hamburg, Germany.

A report from the U.S. consulate at Hamburg, obtained by the Transportation, Communications and Utilities Division of the Department of Commerce indicates the Icelandic air was using considerable trade from competing air carriers. The Icelandic Air Lines is a member of Air Transport Association, of which Loftleidir is not a member.

PSAS—Post-Schandauens Airline System, most severely affected by the competition, already has threatened to

leave IATA. *Aviation Week* (June 20, p. 42) said the U.S. caused IATA to submit its bid to Loftleidir's offer. However, the U.S. denied air transport agreement signed in 1945 makes no provision for price fixing.

Because it is not an IATA member, Loftleidir can change whatever fare it desires on the New York-Bayreuth leg. Key to the Iceland-Europe route is fixed at IATA levels by an agreement the country maintains with several European governments.

Competitor Argument—At present, the carrier is using New York-Hamburg route map fare to the competitor than competing tourist fare. Otherwise rates the passenger \$20.

The Icelandic airline operates under a cooperative agreement with Southern South American and Pan-Europe Air Transport, an independent Norwegian carrier that flies an DC-4 fleet as far east as Hong Kong. Under this agreement, Loftleidir operates on scheduling work with Southern equipment; in Germany, Braniff serves as the Icelandic Air's ticket agent.

► **Car-Rate Competition.** Loftleidir's weekly flight leaves Hamburg and arrives at New York at 10:30 a.m. and returns to Reykjavik the next morning. Tuesday afternoons leaving Reykjavik, it lands in New York Monday morning, the eastbound flight leaves New York

at 10:30 p.m. and arrives back in Hamburg Wednesday morning, returning to Reykjavik and Copenhagen.

PSAS has seven tourist flights to New York weekly. All go through Hamburg. Pan American World Airways operates one Hamburg-New York tourist flight and seven between Frankfurt and New York each week.

To compete with the higher airfares, Loftleidir offers an addition to its regular fare, a luggage allowance of 66 lb as opposed to 44 lb allowed tourist passengers by most carriers. Transportation to and from the Hamburg Airport is free. Icelandic passengers and crewmen do not stay at overnight stops along the trans-Atlantic route as fuel cost for the airline.

Brazilian Airline Wins U.S. Route Rights

Brazilian International Airlines has won certification to fly to the U.S. and is negotiating to buy three DC-8s.

The new transports are scheduled for delivery by April 1958. The company plans to start U.S. airline service, from DC-8s, to New York and possibly to Chicago, New Orleans.

Conversely, another Brazilian air carrier, has dropped its franchise to the U.S. because of failure to get subsidies.

There may be a later entrant for Brazil-U.S. routes. But the airline says its initial entry for three Lockheed Super Constellations was not aimed at North American service. The Super Constellations probably will go into coastal south American service, competing with Pan Am's Brazil, a Pan American World Airways affiliate.

Rail Losses Spur P.O.'s Airlift Drive

Higher fuel costs for railroads may be another spur to Post Office Department's drive for the right to ship some surface mail by air freight.

This was the outlook at conclusion of an Air-Rail-Sur-Water Transport Panel study sponsored by Commerce Department's Robert Morris, Undersecretary of Commerce for Transportation, at the panel with his Industry-Government Transportation Council to find solutions to the railroad's mounting deficit on passenger traffic. An air transport association was at the meeting.

► **Aircraft.** Standard-Intertan, Comair, Eastern, Commercial, reports total railroad passenger-train loss last year at \$644 million. ICC estimates perhaps \$64 million of this is assignable to some

phase of railroad mail service. Higher mail rates may be one answer and discontinuance of some rail mail service another.

Both may further stimulate the Post Office desire to get more and into the air.

► **Pension Law.**—The panel is expected to recommend dropping many rural town passenger trains and using the mail route solution by the New York state legislature. Legislators have found mail roads to be less expensive than long ago, caused to end by the post funds. Legislatives as proposed to permit ICC to override state bodies on the question of discontinuing, economic rail service.

Railroads' coach and first-class passenger rates each weekly are rising from 1 to 12% under a year ago. The rates have been steady the past 12 months.

Braniff Wins Route Acceptance to Subsidy

Braniff International Airways and North Central Airlines planned in early August before Civil Aeronautics Board that neither may want the new mail route route system in the Dakotas and Minnesota proposed by CAB.

The Board started the one by agreeing that Braniff save the route, including several towns in CAB route 600 near Cheyenne, home state of North Dakota. Proposed mail route would serve western intermediate towns from Flaggs to Sioux Falls and from there to Yankton.

CAB, it does not want the proposed local intermediate routes unless it gets a subsidy. That plan, although it would accept Braniff's proposal, was not enough to get Braniff getting a subsidy in its domestic mail route system.

North Central used CAB for the proposed routes at the Flaggs and agreed that although it is the least disadvantage of several pending route-change applications that might strengthen NCA's already-spawning local service routes, North Central plans to acquire Lake Central Airlines and/or Braniff's local Route 100.

Both routes will get rid of Route 100 and drop the mail route number added, unless the Board will order otherwise. Right now, the airline will not be a competitor to rail route of 133 cities in ten state in carrying routes that were consolidated before Braniff acquired them through merger with Mid-Continent last year.

Certificate on NCA's Route 100 is pending.

Both North Central and Clark Airlines will ask CAB to transfer Route 100 to their routes. A Braniff spokesman says his airline will not seek re-

lease of its own certificate on that route unless the Board grants subsidy to operate it.

CAB Names Griffith As Enforcement Chief

Civil Aeronautics Board has named Robert L. Griffith, former Delta and American Airlines executive and attorney, as new chief of the CAB Office of Enforcement. He succeeds Oliver Clegg, who resigned.

A major portion of current work of the Office of Enforcement has been dedicated to prosecuting unscrupulous airlines for exceeding the Board's present limits on route-type passenger revenue volume rates by independent carriers.

The enforcement chief has some data critics to it have seen and have had to stand down on alleged violations. Washington enforcement expect weekly to sustain application of a scheduled airline route, neither as a lower fare nor as added radiance to their job.

CAB will continue to CAB Route 600 from St. Paul-Minneapolis, when he became chairman, during summer 1957. Prior to that, he was assistant to the president of Delta Air Lines (1948-50) and senior vice president-cargo manager of America (1954-55).

Correction

Civil Aeronautics Board examiner, in recommending approval of the Eastern Colonial Airlines merger agreement, also suggested a National-Northeast Airlines merger—not National Northeast as reported in *Aviation Week* (June 22, p. 9).



DC-4 SEAT 100

So-breathe using passenger carrying 100 passengers in a DC-4 flight routes. Inter-Island between Puerto Rico and New York by Flying Tiger Line service. This high density arrangement, offered by Braniff Air Lines Co., designed for passengers who are "smaller than average size." The installation uses less fuel and is comfortable. Flying Tiger and

New York-Balboa Case Heads for Rehearing

The two year old fight over what airline may contract for one-place New York-Balboa, Panama, flight may now end when the Civil Aeronautics Board service is set aside by the President.

The White House has asked the Board to expedite taking any resolution, but Pan American World Airways and Eastern Air Lines refused to waive full procedural rights at preliminary conference (*AVIATION WEEK* June 8, p. 10).

The return may force a complete rehearing of the case.

Washington observers are final dragoon as 1954 at the earliest.

The controversial case can get into trouble more than a year ago when CAB rejected a 3-M-PAA airfare increase on grounds it would not bring enough revenue against a weaker resolution of National Airlines and Braniff International Airlines.

President Truman eventually rejected the Board decision. CAB reconsidered and set the same open ended ticket. This was paperholed, it released it to the Board who left the White House. CAB then sent it to President Eisenhower.

Mr. Eisenhour asked the decision back to the Board again, adding special up-dating of evidence given cold since the hearing, which had been two years ago.

Eastern and Pan American contend that since the original evidence was taken, National and Braniff have grown and now are able to stand up to the EAL-AAL confrontation.



Mobile ticket offices that go looking for customers have been put on the streets of Los Angeles and San Francisco by Trans World Airlines. The idea is to take the point point point to the cities, built by General Motors. With independent to encounter their mind, they will be able to go wherever the crowds are, or follow established routes through calling districts on a single

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alized to require \$2.8 million, virtually the same as last year. In addition, the organization earns more than \$450,000 from various sources. Of the \$1.6 U.S. gate up less than 25%. All in all, the budget is planned to achieve annual savings and it will be difficult for the U.S. delegates to push through any financial cuts.

In addition to its own budget, ICAO estimates this year slightly more than \$1 million in technical assistance granted by the United Nations Technical Assistance Agency. In the past, 28 countries have received such aviation help of one form or another from ICAO.

By and large, the money is spent to finance:

- Teams of experts sent to conduct seminars on all phases of civil aviation from meteorological observation to flight deck automation.
- Workshops to allow ICAO members to study other countries.
- Board members, surveys of the needs for airports and facilities undertaken on behalf of Afghanistan and Thailand.

One thing the delegates stressed was traffic agreed upon was desirability of Dr. Wanzer's continuing as president of ICAO. While preferring to retire on grounds of poor health, he probably will be persuaded to stay on for a

while, though probably not for another three years.

The assembly elected Sir Frederick Troughton, British ambassador to Australia, as president of the fourth session. Vice-president elected: Gen. W. F. Bulger, The Netherlands; H. R. D. Fourtner, Britain; J. Paul Brummer, U.S. and Lakshmi Chandra Jain, India.

—NMK

CAA Cool to ATA Re-organization Plan

Top Civil Aviation Administration sources last week forecast a mixed reception for the 10 panel CAA re-organization program. An unnamed Admin. source said: "It's a U.S. Government of Commerce [Rutherford B.] Moore, despite support of its broad acceptance."

Moore's plan for consolidating the Office of Aviation Safety and merging its activities was a major element of Aircraft Engineering and Maintenance Division. Neither does it appear that the maintenance organization will be retained, as in aircraft engineering, although most aviation industry people agree engineering should retain maintenance. Civil Service and pay appears to have retained both these proposals.

Formation of Blevins as the North Region and re-arrangement of the administration has been endorsed. Watson Ragan to the U.S. Region is not considered to be Blevins.

The recently announced regional re-organization is expected to stand.

Other proposals probably accepted and implemented reductions in Washington personnel: expansion of the program for designated industry employees to supplement work done by CAA agents; a visiting management unit, under which CAA agents or directors would discuss operations with the inlet and outlet before reporting to Washington; two consolidating administrative field offices, and combining statistical reports.

CAB ORDERS

(See 1817)

Cellular Aeromotors Board proposes to finance eight high-speed jet services to Creek Indians.

Mark A. American Airlines was turned down on its request that the Board delay enforcement action by flying some revenue flights from CAB's existing terminal at chairman's point, Seattle Airlines argued that the purpose of the random policy investigation is to write new regulations, update old regulations and to correct the old regulations and a new one is needed.

Visit Air West was granted to fly a single roundtrip on Pacific Northwest Air

lines. Seattle King Salmon, Alaska route became PWA did not accept the claim.

Southern Airways received from some South Carolina towns a total CAB decision against its reconsideration of certain racial order.

Southwest & Western Airlines was presented by its delegates from Memphis to New York June 24 because Pan American World Airways and Trans World Airlines refused to make available for the conference.

After a prolonged debate no major policy change was withdrawn, making for a CAB investigation on the subject on return.

An Transport Admin. source, made application with the Board of Civil Aeronautics and West Coast regional director requested Board to pay compensation out of common carriage. Moore recently has been earning more revenue flights than CAB economic restrictions allows at the present time.

International Air Transport Assn. members were apprised, allowing Airlines to make a San Columbia Company, until

Trans Tropic Airways authorized to fly eight routes to Belize, \$4,000 interpretive fee.

North American Airlines was ordered to stop advertising itself as an air carrier. Reynolds consented to a CAB cease-and-desist order to stop using words like "By Shylock" and the name "Shylock Air Lines" without "Aeromexico, Inc." on the route. Interests reached between Dutch Air Lines and Scandinavian Airlines System, it appears.

North Central Airlines got CAB to take the F-104, N-10, D-11, service rate for calculations with removal of flight crew. American got CAB to take the B-100.

Northwest Airlines director Len G. Jaeger introducing relationship with president and director of Motor Products Corp. approved.

Routes of Alaska, Biggs Alaska, Northern Consolidated and Pacific Northwest Airlines submitted to CAB defense of "Alaska Route Violations Case."

Pan American World Airways has passed deposit of cargo to report at Seattle was determined since time ago, so CAB dropped the informal investigation.

Kansas City Shipyards Corp. says it has no intention of doing airfreight business, CAB demanded prosecution from the freight forwarder policy investigation.

Robert Duke, Inc. was given permission to acquire 30 percent of Jetco, Inc. and have two seats on the carrier. Duke left chairman control of Globe Airlines, Ltd., and South Pacific was reorganized.

Tennessee Air Lines was given permission to fly 74 members of Yuchi by Chero Indians, Okfuskee Indians, Choctaw Indians and the 324-325 Choctaw Indians. American and Northwest defined the certain language of present plane constituents. CAB denied FAA and Northwest protests that Tennessee should be denied permission to fly the flight.

Trans World Airlines was granted approval to a single and of passenger from Western Air, July 1, because the flight was booked before CAB eliminated Western from TWA's route.



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SHORTLINES

■ **Airline** new fleet entering Atlantic Seaboard when in Barrington, Colorado, and those in Bogota, three times a week.

■ **British European Airways** claim \$72,000 profit flying at 75% of capacity the first month of operation with the first test of 26 Douglas Vikings. Vikings on order. — Company says the Vikings' load-area and interior are 80% larger than 55% of BEA Vikings. BEA Vikings at 1,000 m. London Heathrow has 47 seat capacity on scheduled route of 3 hr. 40 min.

■ **Calcas** has purchased four Conairers for twin-Atlantic service.

■ **Frank National Airlines** has received its third and final Convair 100 for Helmsa Stockholder service.

■ **Honduras** is the 50th member of International Civil Aviation Organization.

■ **Kuwait National Airlines** plans to buy a DC-4 to compete with Northwest Airlines on Korea-Japan routes. KNA now flies two DC-3s.

■ **Logan International Airport** has opened its Massachusetts Airport Management Board for a reader 179-meter tower.

■ **Northwest Airlines** president R. E. Stern submitted proposals by TWA and Pan Am to use the Far East as an "act of cancellation" that would affect NWA's routes. At a CAB hearing on the nonstop removal case, Stern called for "the sort of competition that integrates the interest of the carrier, the shipper and the U.S. postal service."

■ **Pacific Northern Airlines** on its May traffic of 931,250 passengers topped the previous record of August 1952 for all cargo carried east of the gate.

■ **Passenger** reports April cargo revenue of \$312,000 was up 19% from 1952.

■ **Pennwest Airlines** says its May volume of 5,065,537 passenger miles set a new record for air local service last for any month.

■ **West Airlines** next month starts its biggest route expansion to date, with extension of Miami-Caribbean vacation service to Chengtu, Detroit, Cleveland and Pittsburgh. Previously,

Atlantic Cargo Permit

Airwork, Ltd., manufacturers and British airline, has applied to CAB for a Foreign air carrier permit for scheduled Trans-Atlantic cargo services to New York. CAB approved a permit under terms of the British U.S. bilateral air agreement.

CAB, meanwhile, is in its seventh year of deliberations over whether to permit one or more U.S. carriers to give non-intertidal Atlantic air cargo services.

■ **Atlantic** and British condominium for scheduled trans-Atlantic cargo service last winter, but will not start operating this route on a regular basis until it acquires more planes. British Endurance owned 50% of British European in the Viking Viking.

■ **Atlantic** is an independent carrier. It has scheduled passenger and cargo service from England to the Middle East and East Africa, and does charter business elsewhere.

Resort first from East Coast cities October schedules Int'l. Caribbean stops available. — Company offers connecting service for Midwest passengers en route en route en route to Miami at the same package fares.

■ **Scandinavian Airlines** Section 108 of its 14 DC-6s is ordered. — Company plans no more trans-Polar flights until it gets regular U.S. and Canadian permits.

■ **Silk Airlines** announces confirmed freight rates of 151.8% on fresh fruits and vegetables from California. Company now flies new Douglas DC-6s plus 18 C-45s.

■ **Southern** is discussing incorporation of service to South America.

Airline Insurance

■ **Civil Aviation Board** says most airlines now have adequate insurance "to cover possible claims arising out of injury or damage to passengers and to persons on the ground."

CAB dropped a proposal to require certain airline liability insurance because most airlines subsequently voluntary adequate insurance coverage, and the Board also found possible liability limits on CAB power to require such insurance.

AVIATION CALENDAR

June 25 July 1-International meeting, American Society of Mechanical Engineers, Hotel Statler, Los Angeles.

July 1-15-International Congress of University Teachers, National College of Education, Kenosha, Ill.

July 15-20-Annual All Women Transoceanic Air Race from Louisville, Mo., to Long Beach, Calif.

July 18-Debut of Cotes County Air Show, Cotes, Okla.

July 26-70th national singing contest, Harris High, Elkhorn, N.Y. Categories in state men's national, women's national, championship club and A, B and C.

July 9-10-20th International Aviation Federation Congress, Wiesbaden, Germany.

July 15-16-45th Annual Service Meeting, House of Delegates, TIA Building, Los Angeles, Calif.

July 18-50th Air power commemorating 10th anniversary of powered flight and 25th in memory of aviation, Air Force, Akron, Colorado.

July 27 Aug. 1-1953 model airplane show, U.S. Naval Air Station, Wicks, Calif., Calif., Pa.

Aug. 2-Ann Arbor, Mich., Japan Air Fair, clearance of 50th anniversary of powered flight, "Endless Approach."

Aug. 3-10-10th International Congress, International Astronomical Federation, Zurich, Switzerland.

Aug. 3-9-24th International Model Plane Show, organized by Friends of the Model Plane Club, Atlanta, Ga.

Aug. 25-Opening of the annual legal committee meeting, International Civil Aviation Organization, Rio de Janeiro.

Sept. 7-15-1953 SEAC Congress, Yunnan Flying Display, Fuxian Lake, Yunnan.

Sept. 7-17-Tenth International Astronautical Congress, joint meeting of IAC and IAF, Paris, France.

Sept. 10-12-1953 National Industrial Edible Instrument Society of America, Sherman Hotel, Chicago.

Sept. 13-19-1953 meeting of Aircraft Spark Plug and Ignition Conference, Champion Spark Plug Co., Toledo.

Sept. 20-21-1953 meeting, National Engineers Conference, Hotel Statler, Chicago.

Sept. 28-Oct. 3-3rd National Aeronautical Meeting, Aircraft Engineering Display and Aircraft Production, focus of the Society of Experimental Engineers, Hotel Statler, Los Angeles.

Sept. 30-Oct. 19th Industrial aircraft equipment conference, American Institute of Electrical Engineers, Seattle.

Oct. 8-8th New England meeting, So. New England, Providence, R. I., Equi-Park, Providence, R. I.

Oct. 10-12-1953 Cleveland (Ohio) (Navy Zeal) air meet with speed and transport biplane trophies.

Oct. 26-30th Annual convention of South Dakota Airport Managers Assn., Dakota Dunes Hotel, Ft. Laramie, S.D.

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TWA's Revitalized Management

What top airline executive has done the outstanding job for his company in the past few years? we have been asking our friends in air transportation and finance over the past 60 days.

Ralph Damon has been the most frequent answer, by far.



Ralph S. Damon

President Jan. 25, 1949

At that time the company was facing unusual financial problems. For three consecutive years it had suffered net deficits, with a cumulative net loss of nearly \$15 million for the period.

Money was low, and everywhere in the industry, you heard it questioned whether TWA could survive.

Now, more than four years later, the modest Damon could—but won't—point out an impressive record of accomplishments that demonstrates the substantial success his administration has achieved. There is a marked improvement in operations and expansion, and a healthy attitude to sound conservatism. And you recall uniformly that it was the same Damon who was called in and put Republic Aviation Corp. on its financial feet after it was taken over from its original management.

The Damon record at TWA can be demonstrated in cold, but very meaningful, statistics.

For example:

For the four years ended Dec. 31, 1952, the company reported cumulative net income totaling \$36.9 million or better. While earnings provided the bulk of funds for the property buildup, considerable new money was brought into the company by various financing operations.

From February 1949 through November 1952, in three separate stock offerings, a total of about \$15 million was added to TWA's equity funds. The cushion as represented in the capital structure could still finance a payment of a \$10.3-million subordinated note issue when common stock in August 1948.

In fairness, however, it should be noted that working capital balances were reduced from \$9.2 million at the 1948 record to \$3.9 million at Dec. 31, 1952, that pos-

itioning since \$53 million toward capital expenditures.

The funds generated by these various series were largely applied to augment TWA's properties, primarily its aircraft fleet.

At the end of 1948 total property and equipment was shown at a net valuation of \$45.9 million, with aircraft consisting of 33 Constellations, 12 DC-4, 64 DC-3s and five old Boeing Stratocruisers.

Four years later aircraft property account rose thus disclosed to \$97.5 million with a decided improvement in the aircraft fleet, comprising 68 Constellations, 10 Super Constellations, 40 Model 44-4s, and 12 Model 214-As.

In the process a major transition has also taken place in the company's capital structure. At Dec. 31, 1948, total debt amounted to \$54.1 million, against a revised equity position of \$10.2 million, or a debt ratio of 5.4 to 1—described in financial circles as an extremely unhealthy situation.

By Mar. 31, 1953, while debt totaled \$59.9 million, equity was bolstered to \$53.7 million, making a debt ratio of almost 1 to 1, a vastly improved situation.

TWA's financial accuracy is considered by Wall Street observers as even more remarkable in the face of the heavy debt capitalization thrust upon it by an inner circle company in a 1948 financing operation. This, according to financial circles, created a distorted, heavy debt structure with a thin equity position which plagued the company during its difficult years and shackled its subsequent equipment acquisition programs.

For example, Wall Street people point out that TWA has had to create debt senior to that held by the successor company. Various debt covenants were imposed to finance its postwar re-expansion program. TWA is the only carrier in its category (the "Big Four") and Pan American which has debt of the stated mortgage varieties.

Actually, a burden has been placed on the company as a result of that past financing pursued by the insurance firm. The scale of debt limitation for the next few years is heavy and is cushioned by only a slight margin in projected cash flowlines. This means that any additional equipment expansion must be provided through new financing and from earnings, and it would not surprise the financial industry if debt authorizations in 1953 and 1954—a refinancing operation may be considered.

There is no doubt expressed, however, as to the ability of the Damon management to cope with its financial and other operational problems.

TWA is aggressive and has shown a definite willingness to assume calculated risks to broaden its marketing attitude that is not discernable often in the major companies in the air transport industry. In becoming the largest operator of aircraft in the United States, TWA has, for example, demonstrated it has the ability to assume leadership in a highly competitive endeavor.

TWA's revitalized management under Ralph Damon represents an outstanding record of achievement.

—Robert H. Wood

*an integrated facility produces
better aluminum
extrusions*



Large hydraulic equipment at the Harvey Tavares plant bakes extrusions to the close tolerances desired after heat treating operations.

One plant and one responsibility delivers extruded or combination extruded and pressure forged parts to you more dependably and faster.

Harvey offers industry an integrated facility in one location which shortens the process from idea to finished product. Management, service, engineering, design, tool-making and all production operations are closely knit into one efficient team.

Responsibility for accomplishment of the specified stage of each part with its up to and including safe delivery at your place.

Our staff of field engineers is always at your call to arrange the service which best suits your needs.

MAKING THE MOST OF ALUMINUM...FOR INDUSTRY

HARVEY
Aluminum

BRANCH OFFICES IN PORTLAND, OREG.
TOMALINE, CALIFORNIA
BRANCH OFFICES IN PORTLAND, OREG.



Sound Advice safeguards jet engine parts

FINGERS OF SOUND probe metal parts for hidden faults as Allison engineers use the Ultrasonic Reflectoscope

It is important that the metals used in critical jet engine parts be completely free of even the tiniest flaws. To eliminate the possibility of minute defects that even X-ray testing will not reveal, Allison engineers rely on an *ultrasonic reflectoscope* to test parts.

Allison was the first aircraft engine builder to use this unique means to search out subsurface faults. Here's how it operates: High frequency sound waves are sent into the metal part under test, and flaws of a rejectable nature cause "echoes" which are electrically recorded on a screen. This "sound advice" enables Allison to detect hidden imperfections that could not be discovered any other way.

Tests like this are another reason for Allison leadership, because they are typical of the thoroughness that pays off in greater dependability and has won the confidence of jet pilots of many nations.



Several engine pieces, like this J33 compressor, receive 100% Ultrasonic inspection



Allison

DIVISION OF GENERAL MOTORS

INDIANAPOLIS, INDIANA

